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NEW PERSPECTIVES ON CENTRAL CHADIC HISTORICAL PHONOLOGY AND LEXICAL RECONSTRUCTION

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Abstract

On the occasion of JWAL's 50th jubilee publication, the article celebrates JWAL's long history of dealing with Chadic languages since its first appearance in 1964. It advocates renewed institutionalisation in Africa of historical linguistics and hopes to encourage African students to make historical-comparative research on African languages a focal domain of their own linguistic research. The article sketches out recent progress in the historical-comparative analysis of the about 80 Central Chadic languages, which form the largest branch of the Chadic language family in West Africa, which as such constitutes the largest family within the Afroasiatic language phylum. Innovative insights regarding the historical reconstruction of Central Chadic phonology and lexicon pertain to a set of typological features that include an early 'root-and-pattern' structure, a basic minimal vertical vowel system, the role of 'prosodies' such as palatalisation, labialisation, nasalisation, and glottalization, as well as petrified root augmentation. This allows to sketch out the diachronic evolution of multi-vowel systems as well as the emergence of innovative consonants in the modern languages which give modern Central Chadic languages their notoriously diverse appearance.

Key words: Chadic languages, Chadic phonology, historical phonology, historical reconstruction, multi-vowel system.

Tsakure
Mujallar JWAL ta fara bayyana ne a shekar 1964. A wajen bukin cika shekaru 50 da fara wallafa wannan mujalla, wannan takarda da na gabatar ta hasko wani dogon tarihi na dangantaka tsakanin mujallar da harsuna 'yan gidan Cadi. Takardar tana kira ga sake dawo da dàbbaƙa nazarin kimiyyar harshe da ya shafi dangantaka ta tarihi tsakanin harsuna a Afirka, sannan kuma tana kira ga ɗalibai 'yan Afirka da su mayar da ƙarfin bincike-bincikensu na ilmin kimiyyar harshe ya zama a kan kwatanta al'amura na tarihi tsakanin harsunan Afirka. Takardar tawa ta yi bayanai a taƙaice na kwatancin al'amuran tarihi tsakanin harsunan tsakiya na iyalan gidan Cadi kusan 80.Waɗannan harsuna su ne mafiya yawa daga cikin rukunai huɗu na harsuna 'yan gidan Cadi a Afirka ta yamma. Haka kuma sun fi kowane rukuni yawan harsuna a cikin babban rukunin harsuna na *Afroasiatic*. Wasu muhimman bayanai da suka tuzgo, waɗanda kuma suka jiɓinci sake bibiyar tarihin ilmin tsarin sauti da fasalin ginin kalmomi a harsunan tsakiya na iyalan gidan Cadi, su ne fitattun alamomi na kashe-kashe kamar su fasalin 'tushe-da-tsari' da fasalin sassauƙan tsari na bai-ɗaya na tsarin wasula da rawar da 'gishirin magana' irin su ganɗantawa da wawuntawa da gunna da hamzantawa da baudewar tsarin tushe suka taka. Duka waɗannan sun ba da damar a fahimci yadda yawaitar tsaruka daban-daban na wasula ta samu a tsarin harunan na dauri da kuma yadda a yau aka sami shigowar sababbin baƙaƙe a harsunan, wanda kuma hakan shi ya sa harunan tsakiya na 'yan gidan Cadi suka yi ƙaurin suna a samun bambance-bamabance a kamannin su.

Kalmomin fannu: Harsuna 'yan gidan Cadi, Ilmin tsarin sauti na harsuna 'yan gidan Cadi, Ilmin tsarin sauti na tarihi, Tsarin fasalin gini na tarihi, Tsaruka daban-daban na wasula

1. Introduction

Ever since its beginnings with its first volume being published in 1964, the *Journal of West African Linguistics* (JWAL) has served as an important publication outlet for papers dealing with the languages of the Chadic family; these would include papers on Hausa, which is West Africa's prominent autochthone lingua franca. Leafing through the most recent bibliography of Chadic and Hausa linguistics (Newman, 2022), we find 40 entries listed for having been published in JWAL, beginning with JWAL's Vol. 1 (1964), later also including two obituaries (G. P. Bargery [1876-1966], Russell G. Schuh [1941–2016]) and a bibliography of R. C. Abraham (1890–1963). The 40 contributions were provided by a total of 33 international authors and co-authors, whose vast majority would appear – telling from their names – to represent Northern Hemisphere ('Western') academia while only a minority of eight carry a name that would point towards an African origin. Quite characteristic for early post-Greenbergian Chadic linguistics, i.e. after Joseph H. Greenberg (1963) had finally reclassified

[1] A few years after the founding of the *West African Linguistic Society* (WALS) under whose auspices the *Journal of West African Linguistics* (JWAL) was established 60 years ago as a leading learned journal in this field, the author became a proud member of WALS while being a student of African linguistics at Hamburg University, Germany, in the mid-1960s. He later served several years as a Member of Council of WALS and currently acts as Member of the Editorial Board of JWAL.
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formerly separated 'Chadohamitic' and 'Chadic' languages (plus a few unclassified languages in Central Nigeria and Chad) as one family within AFROASIATIC, scientific discourse almost immediately acquired a controversial note among the few active researchers in the field. Paul Newman provided the first Chadic linguistics paper in JWAL on CENTRAL CHADIC Tera (Newman, 1964). This was soon followed by a brief note on WEST CHADIC Maha (Newman, 1965), which prompted a controversial reply by Herrmann Jungraithmayr (1967). The first paper on Hausa in JWAL was a brief note by Neil Skinner (1967). Newman, Jungraithmayr and Skinner were soon to become household names in Chadic and Hausa linguistics.

On the occasion of and to celebrate JWAL's 60th anniversary with its 50th published volume, this contribution addresses a case of substantial advances in historical West African linguistics over the past 60 years. The focus is on the 79 Central Chadic (CC) languages listed in the *Ethnologue* (Eberhard et al., 2022). These languages are autochthone to the wider Lake Chad Basin, which is shared by the modern states of Cameroon, Chad, Niger, and Nigeria. The languages form part of the CHADIC family, which accounts for more than half of all the living and extinct languages classified within the Afroasiatic phylum, which relates Chadic genealogically to Ancient Egyptian, Berber (Amazigh), Cushitic, Semitic, and possibly the Omotic languages, all of which were or still are spoken outside the West African region. This makes Chadic the only true West African family within the Afroasiatic phylum, which as a whole, covers vast parts of the northern half of the African continent both north and south of the Sahara, of North-Eastern Africa (with languages spoken in Egypt, Sudan, Eritrea, Ethiopia, Djibouti, Somalia, Kenya), plus South Cushitic outliers in Tanzania and Semitic languages spoken in neighbouring parts of Asia.

1.1 Decolonising African historical linguistics

For a long time, previous to the second half of the 20th century and including the study of African languages, Neogrammarian comparative linguistics was the globally dominant paradigm in linguistics, complemented in the first half of the 20th century by schools of structural linguistics following the teachings and writings of Ferdinand de Saussure and others. The reason for the tremendous success of the so-called Neogrammarian paradigm was the methodological breakthrough (known as the 'comparative method') in the middle of the 19th century regarding the genealogical relationship between Indo-European languages from Sanskrit to Icelandic. Until the end of the colonial period, this dominance affected academia mainly in the Northern Hemisphere, because there were only few institutions of higher education and advanced linguistic research in the Southern Hemisphere, the latter having widely been turned into colonial territories of European powers. Where such institutions existed in the South, they followed models imported by the colonial powers from the colonial motherlands. Recent post-colonial discourse speaks of the 'coloniality of knowledge' that was imposed on the colonised by the colonisers. In a narrow reading, there was no 'African' linguistics during colonialism. Rather, one was dealing with largely Eurocentric studies of African languages, which were, in addition to a number of independent individual researchers, linked-up with academic institutions and/or centres for so-called colonial sciences in the colonial motherlands. Their work rested largely on 'coloniality of knowledge'-based methodology and theory-building, which left room for ideological contaminations including much racial stereotype and prejudice. The situation is best illustrated by the great achievements and grotesque failures of one of the founding figures of European African linguistics, namely the German Carl Meinhof (1857-1944). As convincing as Meinhof (1899) established the genetic unity and history of the Bantu languages based on conclusive comparative-linguistic evidence within the Neogrammarian paradigm, he disastrously failed in his attempt to establish the existence of a 'Hamitic' family of languages in Africa. In Meinhof (1912) he allowed linguistic analysis and reasoning to be heavily flawed by racial pre-conceptions that rooted in the pre-existing simplistic and notoriously wrong 'Hamitic Theory'. This theory had become very popular in Northern Hemisphere academia to account for the assumed 'mixing' of purportedly superior and inferior 'races', and languages in sub-Saharan Africa. Varying degrees of such mixing supposedly explained the remarkable linguistic diversity in Africa. 'Race-based' thinking prevailed in African linguistics until the publication of *The Languages of Africa* by Joseph H. Greenberg (1963), who explicitly pointed out and rejected racial contaminations of historical linguistic research in Africa. He, therefore, proposed to replace the contaminated

labels ‘Hamito-Semitic’/‘Semito-Hamitic’ by the neutral label ‘Afroasiatic’ for the only African language phylum, whose member languages are spoken as autochthone languages mostly in Africa and also in adjacent parts of Asia. He also did away with related hyphenated terms like ‘Chado-Hamitic’ and ‘Nilo-Hamitic’.

A century after the Neogrammarian revolution in linguistics and parallel to Greenberg’s seminal re-classification of the African languages, another linguistic revolution deposed Neogrammarian linguistics from its almost monopoly position in Northern Hemisphere academia, namely Chomskyan theoretical linguistics.[2] Almost by historical accident, the post-WW II paradigm of Chomskyan ‘generative-transformational’ linguistics emerged at the same time when former European colonial territories in Africa entered the final stages of their struggle for political independence and freedom. A growing new post-colonial elite in Africa became eager to seek higher education in the colonial metropoles or elsewhere away from home, since fully elaborated and diversified tertiary education was still in its infancy in many of the new post-colonial states.

The paradigm of Chomskyan theoretical linguistics and its arrogant claim to ultimate scientific superiority over descriptive (or ‘typological’) and comparative (or ‘historical’) linguistic approaches raised heavy controversial reactions from pre- and parallel existing linguistic schools of thought. While non-Chomskyan structuralist and comparative linguistics continued to prevail in many linguistics departments across Europe, Chomskyan generative linguistics rode the wave of post-WW II USA-centred globalisation and was eagerly absorbed in many countries outside the USA in both the Northern and the Southern Hemispheres. Its ever-growing dominance affected more than just one generation of young African scholars of linguistics, who sought post-graduate education at Northern Hemisphere universities, be it in the USA, the former USSR, or in the metropoles of former colonial powers such as the UK, France, Belgium, Italy and Germany with their well-established universities, many of which had linguistics departments, some allowing for a research focus on African languages (see Wolff, 2019).

Currently across much of post-colonial Africa, theoretical linguistics is heavily influenced by US-American Chomskyan and post-Chomskyan schools of thought and is the order of the day. Largely so, because both now retired and still active senior staff had received their academic training under the dominant Western/US-American models of theoretical linguistics, which left no room for historical-comparative research on African languages. In almost global terms, historical-comparative African linguistics became widely marginalised, being considered old-fashioned, too time-consuming, and not gaining bright young linguists academic glory and access to tenure positions at respectable university departments. Whenever new sub-classifications of African languages were needed, rather than resorting to the reliable ‘classic’ time-consuming comparative method, newly developed so-called lexicostatistic methods were applied that promised time-saving shortcuts, but often produced rather doubtful results.

Over the past 60 years, historical-comparative research on African languages became the hobby-horse of a few individual researchers, many if not most affiliated with European academic institutions. Consequently, the historical-comparative analysis of African languages lags severely behind achievements in other domains of African linguistics, to which an ever-growing number of African scholars increasingly contribute new knowledge.

The present paper, apart from its review purpose on progress in historical-comparative West African linguistics with a focus on Central Chadic languages since the beginnings of JWAL 60 years ago, fervently advocates the (re-)establishment of historical-comparative linguistics at African universities in order to allow young African researchers to take over the historical study of their own languages from mainly expatriate-dominated research traditions. This, no doubt, is an overdue matter of both decolonising knowledge and empowering African scholarship comprehensively in all domains of African linguistics.

[2] Note that even Greenberg presented his new classification of African languages by circumventing the application of the Neogrammarian comparative method, a fact that raised heavy criticism at the time from traditional quarters. Rather, he adhered to what was then called ‘mass comparison’, which is nowadays usually referred to as ‘multilateral’ comparison.

1.2 Chadic within Afroasiatic, and Central Chadic within Chadic

There is no reasonable doubt regarding the inclusion of the Chadic family in the Afroasiatic phylum (see Greenberg 1963; Newman 1980). The Chadic language family is conveniently sub-classified into four branches (cf. Newman, 1977, 2006, 2013): West-, Central-, East-Chadic, and Masa.[3] According to Eberhard et al. (2022), Chadic accounts for 196 of the 381 recognised Afroasiatic languages, with the following number of languages per branch: 79 (Central), 73 (West), 36 (East), and 8 (Masa). Among the Afroasiatic languages, Chadic must be rated among the most under-researched families of the phylum. This is particularly true for robust historical-comparative research. One Chadic language, however, stands out in terms of geographical spread, number of first- and second-language speakers as well as quantity and quality of research publications: This is West-Chadic Hausa, one of the biggest autochthone lingua-francas in sub-Saharan Africa. All other Chadic languages can be labelled 'minority' languages with often less than 100.000 or even less than 50.000 speakers.

With roots in pre-Greenbergian (1963) language classifications, which followed suggestions by J. Lukas (1936) by separating 'Chado-Hamitic' from 'Chadic' languages (and, thereby, linking up with the outdated 'Hamitic Theory'), scientific folklore in certain quarters still maintains impressionistic typological characterisations of these languages.[4] According to these, as Roberts (2001) aptly summarises, West and East Chadic languages are attributed "more conservative features characteristic of Proto-Chadic" and CC languages are considered "correspondingly more innovative" and having "phonologically…a number of peculiarities that are not completely general throughout Chadic" (Roberts 2001: 93). The current paper provides evidence why, to the contrary, Central Chadic languages can be considered even more 'archaic' with regard to certain inherited phonological patterns than many languages belonging to the other branches of the family.

1.3 Advances in historical-comparative Chadic and Central Chadic linguistics

The beginning of modern historical-comparative Chadic linguistics dates back to 1966 when Paul Newman and Roxana Ma [Newman] launched a first attempt to provide comparative evidence for Greenberg's (1963) innovative classification of the 'Chad languages', which included the formerly separate 'Chado-Hamitic' and 'Chadic' languages plus a few unclassified languages in Chad and in the Jos Plateau area of Nigeria. Newman and Ma provided 145 etymologies, for which they 'reconstructed' consonants only and indicated assumed positions of vowels by hyphens in view of their "then inability to reconstruct the vowels" (Newman 1977: 3). This first approach was followed by a more robust study by Newman (1977), which contained a first yet still extremely tentative attempt to also identify vowels at the proto-language level. Soon after, Jungraithmayr and Shimizu (1981) published reconstructed consonantal roots, which again, left synchronic vowels historically unaccounted for. In the same year, the present author began to publish historical research on selected CC-A languages of the Mandara and Lamang groups with an explicit focus on the reconstruction of vowels (Wolff, 1981, 1983, Wolff et al., 1981). This pioneering comparative approach explicitly recognised the effects of palatalisation and labialisation prosodies, by which the existence of different synchronic and presumably phonemic vowel inventories could be explained, whose members appeared to escape regular sound correspondences as required by the Neogrammarian comparative method (cf. also Wolff, 2011, 2017, 2022a, 2024). The author's efforts were soon paralleled with corroborative research on CC-A languages in Northern Cameroon by Daniel Barreteau (1983, 1987, 1988). Wolff's and Barreteau's comparative approach was inspired by the discovery of characteristic 'prosodies' (such as palatalisation, labialisation, and prenasalisation) for the synchronic description of the CC-A Higi language a few years before by the late Carl Hoffmann (1965), which was immediately taken up by Roger Mohrlang (1971, 1972) for his own work on Higi. The prosodies' relevance beyond the Higi language was recognised by James Hoskison (1974, 1975) for Gude and by Roxana Ma Newman (1977) for

[3] Following an earlier suggestion by Newman and Ma (1966), the Central Chadic branch is occasionally also referred to as 'Biu-Mandara'. Current sub-classifications distinguish sub-branches A, B, and C for all branches except Masa.

[4] See, for instance, Jungraithmayr (1987: 156): "… le centre, c'est-à-dire le Bassin du Lac Tchad, nous apparaîtrait comme une région de transformation, de développement accéléré, de l'innovation – comparée avec les régions occidentales et orientales qui présentent des formes et des structures plus conservatrices."

Ga'anda, both CC-A languages spoken west of the Nigeria-Cameroon international border. The much wider applicability of Hoffmann's eye-opening discoveries on Higi phonology and of the 'prosodic approach' in general to a number of CC-A languages should eventually revolutionise comparative Central Chadic linguistics as initiated by the present author and the late Daniel Barreteau (1950-2007) in the early 1980s – in particular towards the ultimate goal of providing historical reconstructions of proto-language vowel systems. Later, Carl Hoffmann (1987) added comparative observations on the impact of labialisation prosody on consonantal correspondences in the languages of the then so-called Bura-Margi group of CC-A.

The major stumbling block on the way towards complete segmental lexical reconstructions for both PC and PCC remained the lack of a conclusive theory that would explain the extreme differences in terms of synchronic vowel inventories. At the same time such theory should suggest what the proto-language's vowel system looked like and how the present-day language systems evolved over time.

Before the significance of the prosodic approach for historical-comparative (Central) Chadic studies became obvious, Newman had summarised the synchronic typological variation in Chadic as follows:

> Among present-day Chadic languages, Tangale has been described with nine vowels (Jungraithmayr, 1971), Dangla with seven (Fédry, 1971), and Bole with five (Lukas, 1970-72); but the characteristic Chadic pattern is six vowels *a, ə, i, u, e, o* (H. Wolff, 1959). Of these six vowels, *e* and *o* often have a secondary status, being restricted to loanwords, being recently derived from diphthongs, or being conditioned variants of other vowels. In many languages, moreover, even the four remaining vowels are not fully contrastive, the distinction between i and u, ə and i, and/or ə and u being neutralized in specific phonological environments. The interesting studies by Mirt (1969), Parsons (1970), Mohrlang (1972), and Hoskison (1975) illustrate various languages in which a wide range of phonetic vowels can be reduced to two (or in some positions, three) phonemic vowels contrasting only in vowel height. (Newman 1977: 12)

Newman himself never followed up on the salient question why "[i]n many languages … the four remaining vowels (i.e. *a, ə, i, u* – HEW) are not fully contrastive, the distinction between i and u, ə and i, and/or ə and u being neutralized in specific phonological environments." This question would take another 45 years to be answered by the present author (2017, 2022a) at least for the about 80 languages of the Central Chadic branch. However, by the explicit reference to Mirt (1969), Parsons (1970), Mohrlang (1972), and Hoskison (1975) and a system of two (or three) "phonemic vowels contrasting only in vowel height", Newman (1977: 12) was early to tentatively envisage what today we would call a 'minimal vertical vowel system' for Chadic (for Central Chadic cf. Wolff, 2022a, 2022b, and forthcoming), but again did not follow up this lead with regard to a robust reconstruction of the proto-language vowel system. At that time, Newman offered "extremely tentative" reconstructions that hinged on partly contradictory hypotheses. Leaving the reconstruction of the ultimate proto-language vowel inventory in limbo, the above quote continues as follows:

> The comparative evidence points in the same direction for PC, although it would be premature to claim at this time that PC only had *ə and *a and that *i and *u were merely non-contrastive phonetic variants. On the whole, the choice does seem to lie between a two-vowel system and a four-vowel system with a balanced *i, *a, *u system representing a remote possibility. (Newman 1977: 12)

In the light of the fact that the present author and the late Daniel Barreteau had not yet suggested to integrate Y- and W-prosodies into the reconstruction of vowels, it is not surprising in retrospective that Newman did not take the labialisation and palatalisation prosodies into account, which had hitherto been recognised to be relevant only for the synchronic description of a very few CC-A languages. This deficit stood in the way of a conclusive theory regarding the proto-language's vowel system, although Newman came quite close to the currently favoured solution as reconstructed by the present author for at least PCC, which by itself is likely a retention from the situation in PC:[5]

[5] For illustrative examples, see further below in this paper and consult Wolff (2022a, 2024).

- Indeed, PCC – as most likely also its predecessor PC – had two vowels *ə and *a contrasting only in vowel height. Not discussed by Newman is their different phonological status, namely */a/ being phonemic and *ə presumably being non-phonemic (Svarabhakti).
- *[i] and *[u] were conditioned allophones of */y/ and */w/ in PCC and most likely also in PC. This analysis, however, played no role in Newman's reconstructions.
- Additionally, [i] and [u] were "merely non-contrastive phonetic variants" (Newman, 1977: 12) at least as far as they represented underlying *ə under the effect of prosodies.
- Most of the time and confusing to the non-initiated, larger numbers of surface vowels represent conditioned phonetic variants of lesser numbers of phonemes in specific phonological environments, aggravated by overlapping distributions of allophones and variants.

Generally, therefore, and by not taking the decisive role of prosodies into account, the reconstruction of Chadic vowels remained "an unsolvable task" (Stolbova, 2016: 45). Little progress was made in the field of comparative (Central) Chadic linguistics since the 1980s apart from occasional publications by the present author (Wolff, 2004; 2006; 2015) following a bottom-up approach that was narrowly focused on the two well-documented languages of the CC Lamang group, namely Lamang and Hdi. Eventually, the author's particular line of research into the historical evolution of vowels in Chadic languages was summarised in Wolff (2017).

In a 2006 review paper on comparative Chadic linguistics, Newman sketched out imminent desiderata:

> Chadic really needs a more extensive, properly-done reconstruction of the proto-language, one that could serve as a point of reference for the next generation of scholars. Independent of or in conjunction with PC reconstruction, Chadic could also benefit greatly by detailed lexical reconstructions of the four branches of the family approached from within those branches. (Newman, 2006: 200)

Soon after this call, the languages of the Central Chadic branch indeed became the focus of groundbreaking historical research and proto-language reconstruction. The following years mark fresh input by Richard Gravina (2007, 2011, 2014). Culminating in his PhD thesis at Leiden University in 2014, Gravina pioneered a thoroughly innovative approach to reconstruct the sounds of the common proto-language including vowels and prosodies. His major contribution was to show that the prosodic approach, in combination with the classic comparative method, was promising for the languages of the Central Chadic branch as a whole (with the possible exception of the languages of the Kotoko groups), and not just for a few individual groups of languages. He placed strong emphasis on innovative multiple typologies of CC languages, which allowed him to "categorise the Central Chadic languages typologically as following one of four phonological systems" (Gravina 2014: 403). He postulated four essential parallel phonological systems, which are based on variant behaviour of the presumed underlying proto-language vowel system *a, *ɨ, *i under the optional regime of a reconstructed phonemic Y-prosody. Reflecting the segmental targets of his reconstructed Y-prosody, Gravina (2014: 87) distinguished languages according to

- a vowel prosody type, showing "the presence of vowel harmony caused by prosodic features of palatalization or labialization";
- a consonant prosody type "characterised by complex systems of labialized and palatalized consonants";
- a mixed prosody type "where elements of vowel prosody and consonant prosody have combined";
- the case of the Kotoko languages, "whose phonological system doesn't fit any of the other systems".

According to Gravina, these essentially different types co-exist across Central Chadic.[6] Gravina explicitly integrated previous insights by Wolff (1981, 1983), Wolff et al. (1981), and Barreteau

[6] However, closer scrutiny reveals significant areal restrictions for each type (see also Gravina 2014: 181 [Map 24]). In the present author's understanding, these types reflect more recent areal surface-level diversifications that

(1987). In particular and at variance with all previous authors, Gravina reconstructed a typologically somewhat quirky system of three phonemic vowels */a/, */ɨ/, */i/, and a unique role for phonemic Y-prosody (i.e. palatalisation), and he dismissed W-prosody (i.e. labialisation) to a minor and areal feature without phonemic status. Therefore, and despite certain commonalities of approach, Gravina's historical analysis of the PCC sound system and his lexical reconstructions differ in essential theoretical assumptions and methodological procedures from the present author's approach as developed and refined in several publications between 1981 and 2017. In particular and at variance with the present author's insights, Gravina

- postulates a cross-linguistically rather exceptional 3-vowel system *a, *ɨ, *i for PCC, while admitting that "[i]n general, the Central Chadic languages are described as possessing very few underlying vowels, typically two, but in some cases just one" (Gravina, 2014: 403);
- disregards the genealogical typological Afroasiatic heritage of a 'root-and-pattern' structure that was retained in PCC, but rather
- postulates for PCC that "words are made up almost entirely of CV syllables", i.e. viewing PCC as being of "essentially CV nature" (Gravina, 2014: 352);
- reconstructs palatalisation prosody for PCC as an independent phonemic unit and thereby as being essentially different from parallel-existing labialisation prosody, for which he considers "back-rounding vowel harmony and the labialization of labial consonants … not due to a Proto-Central Chadic labialization prosody, but … of comparatively recent origin" (Gravina, 2014: 404);
- disregards the significance of distinguishing between 'simple' and 'augmented' roots, the latter representing multi-morphemic words that contain semantically bleached and 'petrified' morphological markers from PCC grammar.

Taking advantage of the publication of both Gravina's PhD dissertation in 2014, and the public availability of his comparative database (Gravina, 2015), the present author eventually decided to comprehensively present his own perspective (Wolff, 2022a, 2024). After allowing eight years to pass for Gravina's pioneer work to be internationally recognised as such, publishing complementary analyses and reconstructions was considered illuminating in terms of comparing different theoretical, methodological, historical and typological assumptions based on the same set of primary linguistic data. It allows fellow linguists to develop their own interpretations based on competing analyses. The major points of difference pertain to the following features attributed to the common proto-language (PCC), see Table 1.1.

Table 1.1 Major points of difference (Wolff [2022a, 2024] vs. Gravina [2014])

PCC	Wolff	Gravina
Vowel phonemes[7]	*/a/	*/i/ */ɨ/ */a/
Non-phonemic vowel (Svarabhakti)	*[ə]	---
Reconstructed PCC prosodies	Y-prosody W-prosody	Y-prosody (W-prosody) ---

have evolved from one common unique underlying phonological system that would have prevailed in the proto-language, and which was quite different from the reconstruction by Gravina.

[7] Gravina's position on the status of 'schwa' (represented by IPA ɨ) as phonemic remains weakly supported.

> The vowel *ɨ is often considered to be epenthetic in individual languages, i.e. as not existing in the underlying form of a word. Here it will be treated as a vowel phoneme, largely for pragmatic reasons… Establishing the status of this vowel is difficult with living languages and with reconstructed languages it is not possible to reach a reliable conclusion…
>
> At this stage, reconstructions are fairly tentative, since very little is known about sound changes affecting vowels that have taken place in the history of CC. (Gravina 2014: 333)

The present author's alternative approach clearly identifies 'schwa' (represented by IPA ə) as epenthetic on the level of the proto-language. He also establishes highly regular sound changes that both phonemic and epenthetic vowels have undergone in their linguistic histories from PCC to the modern CC languages.

	N-prosody ʔ-prosody	---
Diachronic desegmentalisation & prosodification of segments	YES	NO
Diachronic phoneme splits	YES	NO
Sub-system typology: - vowel prosody type - consonant prosody type - mixed type - Kotoko group languages	areal	essential PCC
Basic phonological structure	Afroasiatic-type 'root-and-pattern'	Essential CV syllable structure
Prenasalised obstruents	---	*/ᵐb/, */ⁿd/, */ⁿdz/ (*/ᵑg/), (*/ᵑgʷ/)
Voiceless labial fricative	*/f/	---

Chadic linguistics, therefore, is currently privileged by access to deep insights into the phonological history of one of the family's branches as provided by three recent book-length publications, namely Gravina (2014) and Wolff (2022a, 2024). The public availability of Gravina's (2015) valuable database prompted the present author's decision to make use of the same database and publish his own insights based on almost life-long historical-comparative research into CC phonology. Confronting same-data based alternative approaches and analyses should enhance our understanding of the complexities of the linguistic history from the common proto-language to the modern CC languages. Future research will eventually strengthen or weaken the plausibility and probability of some of the proposed hypotheses and reconstructions. In terms of scholarly progress, the analytical challenges provided by the diachronic development of synchronic Central Chadic 'vowel systems' have finally been faced, starting off from the reconstruction of a minimal vowel system for the proto-language. Further, by reference to a typology of Chadic vowel systems suggested by Schuh (2017), we can now delineate the evolution of the reconstructed minimal vowel inventory, namely */a/, *ə, from PCC to modern Chadic vowel systems, which rest on between one (always /a/) and 15 (short and long) phonemic vowels.

2. Reconstructing Proto-Central Chadic

Contrary to impressionistic assumptions in certain quarters, the languages of the Central Chadic branch reflect a fair number of reconstructed and assumed archaisms, which link these languages to historically older levels of at least Proto-Chadic, if not – in a few details – even to the level of Proto-Afroasiatic, which future historical-comparative and typological research into Afroasiatic as a whole would have to confirm or reject. The present paper sketches out some such probable archaisms that run counter to the scientific folklore according to which CC languages are more innovative and less archaic than the languages of the other branches of the family (see 1.2 above).[8]

2.1 Segmental sub-inventories based on the feature [±syllabic], and the structure of 'roots'

At variance with previous Chadic proto-language reconstructions, Wolff (2022a, 2024) recognises a significant distinction between three segmental sub-inventories in order to explain the properties of the complex vocalic domain in PCC, namely consonants, approximants, and vowels. With the exception of consonants ([-syll]), both approximants ([±syll]) and vowels ([+syll]) provide four basic phonetic surface vowels that we reconstruct for the proto-language and which have reflexes in the vocalic domain of modern CC languages, namely *[a, ə, i, u]; see Table 2.1.

[8] Some of the issues referred to in the following sections were discussed at the *11th Biennial International Colloquium on the Chadic Languages* (Wolff, 2022c).

Table 2.1. The vocalic domain in Central Chadic

Historically underlying (PCC)	Basic surface-level vowel qualities in modern CC languages
Approximants [±syll] [+high] */y/ */w/	[i] [u]
Vowels [+syll] [-low] *ə [+low] */a/	[ə] [a]

Both approximants and vowels, which were jointly referred to as 'vocoids' in Wolff (2017, 2022a), therefore, allow the formation of syllable nuclei and, therefore, play a role in the syllabification processes of consonantal roots under the regime of an Afroasiatic-type 'root-and-pattern' structure (see 2.4 and 2.6 below).

The basic composition of PCC consonantal roots was the following. Minimally one and rarely more than three or four consonants and/or approximants were followed by lexical-final */a/ (which we reconstruct, debatably, by default); see Table 2.2.

Table 2.2. The structure of PCC lexical roots

[-/±syll]				[+syll]
C_1	(C_2)	(C_3)	(C_4)	a

In the formation of proto-language roots, approximants counted as [-syll] 'radical consonants' (cf. their label 'weak radicals' in Semitic scholarship). In phonetic surface realisation, however, whenever they end up in syllable-nucleus positions, they regularly appear in the shape of their conditioned vocalic [+syll] allophones [i, u]. In syllable-margin positions, i.e. in syllable onset and/or coda, they would appear in their [-syll] consonantal allophone shapes [y] and [w]. Therefore, high vowels need not be reconstructed as separate phonemes for PCC.[9]

We illustrate the essential complementary distribution of the approximant allophones with the following examples. For the lexical item 'female breast, udder, milk', we reconstruct C_2 = */w/, namely PCC ***ɗ(a)w(a)xa** (Gravina: ***ɗɨwah**).[10] In a fair number of languages, this C_2 ends up in surface-level syllable-nucleus position as high back-round vowel [u] (see exx. under 2.1a), while in other languages it retains its non-syllabic feature option and surfaces in syllable margin positions as [w] (see exx. under 2.1b).

(2.1a)	PCC root:	simple	***ɗwxa**	underlying syllable structure	phonetic transcription	Sound changes

[9] In his alternative approach and also at variance with Newman (1977), Gravina (2014) reconstructs a high front vowel *i and a high central vowel *ɨ (instead of a mid-central vowel ə) as part of a cross-linguistically highly exceptional set of the three phonemes, namely [+high] */i/, */ɨ/ and [+low] */a/. Note, however, the – suspicious and unexplained – absence of the high vowel */u/ also here. Gravina's reconstructed PCC vowel system thereby largely matches the reconstructed vowel inventory *i, *ə, *a that Newman had suggested as "extremely tentative" for initial and medial positions in PC:

> In the reconstructions in this paper, I make use of all four vowels in final position, two vowels (*i* and *a*) in initial position, and, with a few exceptions, two vowels (*ə* and *a*) in medial position. It should be emphasized, however, that these vowel reconstructions are extremely tentative and, in each case, must be subjected to critical examination before being accepted as correct (Newman 1977:12).

[10] For details of the author's reconstructions and the operation of prosodies in PCC, see Wolff (2022a, 2024). Reconstructed PCC simple roots are given in **bold**, synchronic data transcriptions from the database are given in *italics*. Language groups of the underlying sub-classification of CC (Gravina 2011) are given in SMALL CAPITALS. For the sake of completeness and comparison, Gravina's (2014, 2015) alternative lexical PCC reconstructions are also quoted where different from our own. Note the following symbols and abbreviations:

Ø = deleted/diachronically 'lost' segment;
RED = reduplicative material;
. = syllable boundary in underlying synchronic forms.

Raised symbols ^{y}, ^{w}, ^{ɲ}, ^{ʔ} represent the *palatalisation, labialisation, prenasalisation, glottalisation* prosodies, which historically stem from articulatory features of reconstructed segments in the PCC segmental chain of a word.

	Hdi (LAMANG)	*ʔwØa	*w.ʔa.	*u'a*	*ɗ → ʔ; metathesis; *w → u
	Podoko (MANDARA)	*ɓwØa	*w.ɓa.	*uɓa*	*ɗ → ɓ/__w; metathesis; *w → u
	Tera (TERA)	*RED-ɓwØØ	*ɓw.ɓw.	*ɓuɓu*	*ɗ → ɓ/__w; *w → u
(2.1b)	Bura (MARGI)	*ʔw^{w}Øa	*ʔ[ə]^{w}.wa.	*'uwa*	*ɗ → ʔ; *w → w^{w}; ə-epenthesis; *ə^{w} → u
	Sharwa (BATA)	*ʔwØa	*ʔwa.	*'wa*	*ɗ → ʔ
	Mafa (MAFA)	*ØwØa	*wa.	*wa*	
	PCC input:	***ɗawxa**			
	Matal (MANDARA)	*ØawØa	*a.wa.	*awa*	

The same holds for */y/ → [i]. In the lexical reconstruction for 'compound, house, home' (PCC ***ɣ(a)ya**; Gravina: ***hay**), C_2 = */y/ may end up in surface-level syllable-nucleus position as high front vowel [i] (see exx. under 2.2a), while in other languages it retains its non-syllabic feature option and surfaces in syllable margin positions as [y] (see exx. under 2.2b).

(2.2a)	PCC simple root:	***ɣya**	underlying syllable structure	phonetic transcription	Sound changes
	Sukur (SUKUR)	*ɣyØ	*ɣy.	*ɣi*	*y → i
	Bana (HIGI)	*ɣy^{y}Ø	*ɣ^{y}y.	*ɣyi*	*ɣ → ɣ^{y}; *y → i
(2.2b)	PCC simple root:	***ɣaya**			
	Ouldeme (MOFU)	*ɣayØ	*ɣay.	*ɣay*	
	Podoko (MANDARA)	*kaya	*ka.ya.	*kaya*	*ɣ (→ *g) → k

2.2. The PCC minimal vowel system

The Proto-Chadic vowel system had hitherto escaped conclusive final reconstruction. Some Chadicists still consider vowels to be essentially impossible to reconstruct, others propose one (*a), two (*a, *ə), three (*a, *i, *u) or four (*a, *ə, *i, *u) vowels for PC. For PCC in particular, the same sets have been proposed with the addition of *a, *ɨ, *i as suggested by Gravina (2014). According to the present author's comparative research, PCC most likely operated a minimal vertical vowel system based on tongue height ([±low]), which only knew one phonemic vowel */a/ ([+low]) and used non-phonemic Svarabhakti 'schwa' *[ə] ([-low]), together with conditioned allophones of the approximants */y/ and */w/, to operate a phonetic surface vowel inventory of four basic qualities [a, ə, i, u]. This inventory of four phonetic vowels rested on three reconstructed phonemes, namely */a/, */y/, and */w/, plus non-phonemic (epenthetic Svarabhakti) 'schwa'. In all likelihood, this system mirrors the situation that prevailed already in PC, which was maintained in PCC and which has cross-linguistic typological parallels (Wolff, forthcoming). In this sense, PCC could be considered to reflect the more archaic system of PC. In modern Chadic languages, the allophonic realisations *[i], *[u], and often also the epenthetic vowel *ə of the proto-language, underwent phonologisation and synchronically may now function as vowel phonemes in so-called 'intermediate' or 'maximal' vowel systems.

PCC (and by conjecture PC), therefore, is reconstructed without a vowel 'system' in the narrow sense, because it recognised only one phonemic vowel */a/. Rather, the proto-language's vocalic domain was populated by phonetic vowels of quite different phonological status:

- [i] and [u] were conditioned complementary syllabic allophones of the approximants */y/ and */w/ in syllable-nucleus positions;
- [a] represented the only true vowel phoneme */a/;
- *ə ('schwa') was a predictable non-phonemic Svarabhakti vowel used for phonetic syllabification of consonants (see 2.6 below), whose phonetic realisations depended massively on the phonological environment, in particular on the presence or absence of prosodies.

By subsequent language evolution, the reconstructed */a/, *ə minimal vowel system of PCC would, in many modern CC languages, develop into intermediate vowel systems with three or four contrastive vowel phonemes.[11] See Table 2.3.

Table 2.3. The early stage of evolution of 'intermediate' vowel systems in Central Chadic

Diachronic				Synchronic	
phonetic		phonemic		phonemic	
*[i]	*[u]	*/y/	*/w/	/i/	/u/
*[ə]		---		(/ə/)	
*[a]		*/a/		/a/	

The phonological status of central non-low vowels, which are transcribed by using IPA symbols *[ə] and *[ɨ], remains open.[12] Generally referred to as 'schwa', their transcription and status as either phonemic or predictable non-phonemic epenthetic vowel would appear to depend largely on the preference of the describing linguist for individual languages, at least for the CC languages.[13]

The acceptance of only one phonemic vowel */a/ for the proto-language makes the whole notion of vowel 'system' debatable, since one vowel can maximally contrast with its own absence. The one-vowel solution currently gains support from three quarters:

- recent comparative and typological research into CC languages that takes Afroasiatic heritage into account (Wolff, 2017, 2022a, 2022b, 2024);
- scattered evidence from West and East Chadic and Masa group languages (Schuh, 2002, Roberts, 2007, 2009);
- cross-linguistic evidence for typologically similar minimal vowel systems in languages of the world (Wolff, forthcoming).

The evidence, and if scattered, from all over Chadic suggests that the PCC minimal vowel system could be a retention of an archaic feature to be reconstructed for PC, if not for Proto-Afroasiatic.

[11] Whereas the label 'minimal' vowel system has some currency in general phonological literature (cf. Wolff, forthcoming), the labels 'intermediate' and 'maximal' vowel systems were introduced into Chadic linguistics by Schuh (2017).

[12] Note that the database (Gravina 2015) on which our research rests use both transcriptions according to language source. This practice is followed here as well. Gravina (2014), on the other hand, generally substitutes ,'ɨ' for 'ə'. There is no agreement in the literature regarding the phonetic features of the non-low central vowel, nor its phonological status, nor whether we need to accept an areally restricted existence of two non-low central vowels at least for some languages in some branch(es) of Chadic. The options are to accept and possibly reconstruct *ə ([-low, -high]), *ɨ ([-low, +high]), or both in a parallel fashion. This question may link up with one's assumption of whether the common proto-language (either PCC or PC) had phonemic high vowels *i and *u in addition to allophonic syllabic realisations of the approximants */y/ and */w/ or not. If not, as we claim, reconstructed phoneme splits */y/ → */i/,*/y/ and */w/ → */u/, */w/ may have fostered a parallel split of *ə → *[ə, ɨ] in some languages of the family, where one variant may have later become phonologised and the other remained epenthetic. Answers to these questions may come from future research into East Chadic (and Masa) languages.

[13] Note that Roberts (2022) provides good evidence that both *ə and *ɨ should be kept phonologically apart in at least a few East Chadic languages such as, for instance, in Ndam.

2.3 PCC prosodies

A salient feature of Central Chadic languages is the operation of so-called prosodies of a particular type. By the notion of 'prosody' in Chadic linguistics we refer to the observation that PCC consonants and approximants may become sources of 'prosodification'. In the process of desegmentalisation and prosodification, features such as PAL/palatal(isation), LAB/labial(isation), NAS/(pre)nasal(isation) and GLOT/glottal(isation) disassociate from the original segment and 'float' within the morpheme or word boundaries to re-associate with one or more other segments in the segmental chain. They thereby create phonetic 'colourings' of reconstructed consonants and vowels. We reconstruct this type of prosodies to have operated already on the proto-language level of PCC. In the modern languages, such 'coloured' diachronic variants or allophones may have developed into innovative synchronic phonemes, which as such are not reconstructed for the proto-language, thereby having created richer multi-vowel systems. In some CC languages, however, prosodies can be viewed as still being productive where they turn minimal vowel systems of synchronically underlying abstract phonological representations into multi-vowel surface-level phonetic realisations, i.e. where 'prosodic colouring' can still be analysed as a synchronic process.

According to the author's most recent studies (Wolff, 2022a, 2024), PCC is reconstructed with four such prosodies, of which NAS (prenasalisation, N-prosody) and GLOT (glottalisation, ʔ-prosody) may only affect consonants and approximants. PAL (palatalisation, Y-prosody) and LAB (labialisation, W-prosody) affect both vowels and consonants. These prosodies enlarge the synchronic phonetic inventories of consonants and vowels due to the 'floating' characteristics of the articulation features PAL, LAB, NAS, and GLOT. In the course of time, some or all of the resulting palatalised, labialised, prenasalised and glottalised segments have become phonologised in some languages and have enriched their synchronic phoneme inventories both in terms of vowels and consonants. For the phonetic effects of Y- and W-prosodies, see Table 2.4.

Table 2.4. PAL and LAB prosodies creating 'coloured' phonetic variants of reconstructed PCC sounds

PCC	Ø-prosody	Y-prosody (PAL)	W-prosody (LAB)	Y+W-prosodies[14]
*/y/	[y ~ i]	---	---	---
*/w/	[w ~ u]	---	---	---
*/a/	[a]	[æ ~ ɛ ~ e]	[ɔ ~ o]	[œ]
*ə	[ə]	[ɪ ~ i̵ ~ i]	[ʊ ~ u̵ ~ u]	IPA [y ~ ø]
*/C/	[C]	[C^{y}]	[C^{w}]	(?)
*/C^{w}/[15]	[C^{w}]	---	[C^{w}]	(?)

Scattered evidence provided by Schuh (2002) and Roberts (2007, 2009) suggests that such prosodies can no longer be considered unique characteristic typological features of CC languages, but rather can be reconstructed for PC, but have largely eroded in branches other than Central Chadic. Prosodies would thus constitute yet another archaism in the languages of the Central Chadic branch.

Note that the unifying notion of 'prosody' in Chadic linguistics covers also those sound changes, which in non-prosodic analysis might be analysed and described as cases of near and distant assimilation; some authors use the term 'vowel harmony' to describe the effects. For illustrative examples of the diachronic operation of prosodies in CC languages, see section 4 below.

[14] So far in our research, we have not found cases for which to assume the combination of Y- and W-prosodies on reconstructed PCC consonants, in addition to cases of combined effects on vowels which occasionally occur.
[15] Both Gravina (2014) and Wolff (2022, 2024) reconstruct PCC with a series of labialised velars. Note that prosodies do not accumulate, i.e. any W-prosody effect on labialised velar consonants is neutralised.

2.4 Early 'root-and-pattern' structure

Preserving manifestations or showing traces of a historically underlying early-type Afroasiatic 'root-and-pattern' structure can be considered another archaism in CC languages. 'Roots' were formed by consonants and approximants (together referred to as 'radicals'), and vocalisation 'patterns' were licensed by insertion of */a/ between radicals. This created different 'root types'; lexical-final */a/ was – debatably – provided by default. The most common root shapes were the following, using the symbol 'C' to cover both consonants and approximants; see Table 2.5.

Table 2.5. PCC basic root shapes

mono-radical	bi-radical	tri-radical
C_1a	C_1C_2a	$C_1C_2C_3a$

The optional root-medial insertion of the vowel phoneme */a/ would exhaust the options for vocalisation patterns in this early-type Afroasiatic root-and-pattern structure system, since other phonemic vowels were not available in the system; see Table 2.6. The identification of underlying root types facilitates the search for regular sound correspondences between synchronic vowels in the modern languages, because by the root type we know the positions of */a/ in historically underlying forms. Other synchronic surface vowels would be reflexes of either *y or *w, or of pro- and epenthetic *ə.

Table 2.6. PCC simple-root types formed by optional a-vocalisation

bi-radical		tri-radical	
Ø-vocalisation	a-vocalisation	Ø-vocalisation	a-vocalisation
C_1C_2a	C_1aC_2a	$C_1C_2C_3a$	$C_1aC_2C_3a$ $C_1C_2aC_3a$ $C_1aC_2aC_3a$

At our present stage of knowledge, we can only assume but not yet solidly reconstruct, the association of a-vocalised root types with semantic and grammatical categories in PCC, such as 'broken' nominal plurals and pluractional verb formations, as operating productively (or being only in rudimentary use) in a number of present-day CC languages. In traditional Afroasiatic linguistics, such formations are sweepingly subsumed under the notion of 'internal a', but see Newman (1990) and Wolff (2009) for a critical review of so-called internal-a formations in Chadic.

2.5. Recovering PCC early triliteralism

Regarding phonological and lexical reconstruction of Proto-Chadic with a focus on the consonantal structure of roots, received wisdom is summarised as follows:

> The general appearance of the PC reconstructions is very much in line with our usual impressions of Chadic languages. For example, we find diconsonantal words to be the norm, monoconsonantal words to be less numerous but still quite common (but mostly with verbs and function words), and triconsonantal words to be rare and limited almost exclusively to nouns. (Newman 1977: 20)

This impression fed into judgements according to which CC languages are 'less conservative' in comparison to the languages of the West and East branches of Chadic, which in pre-Greenbergian classifications were labelled 'Chado-Hamitic' (see Westermann and Bryan, 1952), and which appeared to show a preference for trilateral roots (and thereby met the expectations of predominant Semito-centric Afroasiatic linguistics and its assumptions about canonical root structures). Most recent reconstructions have shown, however, that even a majority of PCC roots were originally triradical but have lost consonantal material over time (cf. Gravina 2015; Wolff 2022a, 2024). Frequent 'triliteralism' (or 'triradicalism') as apparently canonical in Semitic languages, therefore, can be considered another PCC archaism. Our recent research reveals that reconstructed poly-consonantal roots have undergone massive historical

loss of segments during the development from PCC to the modern languages, who indeed tend to show a rather low percentage of triconsonantal roots in the synchronic forms of their simple (i.e. non-augmented, see 2.7 below) lexical roots.

Deletion or historical loss (marked by the symbol Ø) may affect any segment of a root. Diachronic rules that govern deletion processes on the proto-language level have not been found; we rather assume that deletion/loss of segments belongs to stages of post-PCC individual language histories. It affects simple and augmented roots without discrimination of simple-root internal and augmented segments; see 2.7 below.

The following examples show monoconsonantal synchronic realisations of reconstructed triconsonantal roots for both a noun and a verb in modern CC languages. The first example is 'bone' (PCC ***ɗy(a)ɬa**; Gravina: ***ɗiɬ**).[16] Its underlying triconsonantal structure is apparent in Margi (MARGI), where C_1 */ɗ/ and C_2 */y/ are maintained and C_3 */ɬ/ changes to /x/, while suffixal */k^w/ weakens to [w] and regularly syllabifies to [u] in final-syllable-nucleus position:

(2.11) Proto-Margi input		*ɗyaɬa-k^w		
Margi		*ɗyaxØ-w	>	*dyahu*

In Glavda (MANDARA), the first two root consonants are lost, the root surfaces synchronically as monoradical:

(2.12) PCC simple root		***ɗyɬa**		
Glavda		*ØØła	>	*ła*

Occasionally, CC languages compensate for lost segments, for instance by reduplication (RED), as happens also in Glavda where the language created a reduplicated parallel form:

(2.13) Proto-Glavda input		*RED-**ɗyɬa**		
Glavda		*ła-ØØła	>	*łała*

The reconstructed triconsonantal verb root for 'to give birth' (PCC ***w(a)x(a)ya**; Gravina: ***wahay**) allows for synchronic monoconsonantal realisations in quite a number of modern CC languages. Any of the three reconstructed radical consonants may be the one to 'survive' in synchronic surface forms of the word.

(2.14) 'to give birth' (PCC ***w(a)x(a)ya**)

PCC simple root type	***wxya**		
Merey (MOFU)	*wØØa	>	*wa*
Tera (TERA)	*ØxØa	>	*xa*
Mafa (MAFA)	*ØØya	>	*ya*

Various quasi-intermediate diconsonantal forms are also found. E.g.

(2.15) PCC simple root type	***waxya**		
Vame (HURZA)	*waxØa	>	*wah(a)*

(2.16) PCC simple root type ***wxaya**

[16] Gravina's reconstruction ***ɗiɬ** reflects C_2*y as *i, which is obviously based on the regular syllabification of *y → {i] in syllable-nucleus positions. C_2 *y is also visible as [i] when the original C_1 *ɗ of the PCC simple root is lost and *y becomes the word-initial segment in syllable-nucleus position, as, for instance, in Kirya (HIGI) *iɬa* and Gude (BATA) *ila* from *Øyɬa < PCC ***ɗyɬa**.

Cuvok (MAFA)	*Øxaya	>	*haya*

(2.17) PCC simple root type ***wxya**

Zina (KOTOKO-SOUTH)	*wØya	>	*wiya* (*^{y}/wya/)

For a full tri-consonantal reflex of this root in a modern language, see

(2.18) PCC simple root type ***waxaya**

Mbuko (HURZA)	*waxayØ	>	*wahay*

2.6 Three-step root syllabification

Since PCC roots were made up of only non-vocalic segments in non-final positions, they underwent up to three steps of syllabification in order to create syllable nuclei in the segmental chain of the root. The steps and processes followed the order of a sonority hierarchy, provided the preceding step did not produce fully syllabified words.[17]

1. Syllabification by a-vocalisation
The insertion of */a/ between radicals created syllable nuclei. See Table 2.7.

Table 2.7. PCC simple roots syllabified by optional a-vocalisation

Underlying simple root:	biradical: CCa	triradical: CCCa
Syllabification by a-vocalisation pattern:	Ca.Ca.	Ca.CCa. CCa.Ca. Ca.Ca.Ca.

2. Syllabification of approximants
When the root contained approximants, these could be turned into syllable nuclei by syllabification, i.e. *y → [i] and *w → [u]. Note that in terms of root structure and again reflecting a Proto-Afroasiatic archaism, approximants counted as consonants. See Table 2.8.

Table 2.8. Simple roots syllabified by approximant syllabification

Underlying simple root:	biradical: CCa		triradical: CCCa	
	*/yCa/ */Cya/	*/wCa/ */Cwa/	*/yCCa/ */CyCa/ */CCya/	*/wCCa/ */CwCa/ */CCwa
Syllabification of approximants:	i.Ca. Cia.	u.Ca. Cua.	i.CCa. Ci.Ca. CCia.	u.CCa. Cu.Ca. CCua.

3. Vowel epenthesis
If steps 1 and 2 did not produce fully syllabified word forms, prothetic and/or epenthetic vowels (symbolised by 'schwa') would be used to syllabify consonants down a sonority scale (liquids – nasals – voiced fricatives – voiceless fricatives – voiced stops – voiceless stops). See Table 2.9.

[17] In the following examples, syllable boundaries are symbolised by '.'.

Table 2.9. Simple-roots syllabified by ə- epenthesis and prothesis

Underlying simple root:	biradical: CCa	triradical: CCCa
Prothetic ə-insertion:	əC.Ca.	əC.CCa.
Epenthetic ə-insertion:	Cə.Ca.	Cə.CCa. CCə.Ca. Cə.Cə.Ca.
Pro- & epenthetic ə-insertion:		əC.Cə.Ca

In this way, root syllabification created the four basic vocalic phonetic surface realisations that would form syllable nuclei in the segmental chain of syllabified roots: [a, i, u, ə]. Note that these basic phonetic vowel qualities would potentially undergo quality variations by assimilation and/or so-called prosodies depending on the phonological environment (see Table 2.4.).

2.7. Root augmentation

Our lexical reconstructions show that PCC was a highly agglutinative language, in which several morphological markers could occur in both prefixal and suffixal positions to the simple root. In the course of individual language histories, many of these markers bleached semantically and subsequently petrified and fused with the original simple root. These former grammatical morphemes, of which until now we have reconstructed 15 by shape, became frozen elements of synchronic 'augmented' roots and need to be recognised in the historical reconstruction of the proto-language. See the examples in section 4 for illustration. The presence of augmented roots in synchronic modern CC languages reflects a reconstructed agglutinative morphological structure of the proto-language, which likely constitutes another archaism in Central Chadic.

3. From PCC to the modern languages

Besides massive effects of both natural and contact-induced sound changes affecting consonants, the most spectacular diachronic development in Chadic languages is the evolution of their synchronic vowel systems. It ranges from a reconstructed PCC minimal vowel system based on one vowel phoneme */a/, which is most likely a retention from PC, to 'maximal' systems in modern languages with 15 or more short and long vowels. This diachronic development is also referred to as 'vocalogenesis' (Wolff, 2017). Another remarkable historical development is the emergence of innovative consonantal segments in the modern CC languages, which are not reconstructed as part of the proto-language consonant inventory and which have also come about by the effects of prosodies, such as, for instance, new glottal consonants and prenasalised obstruents (see examples in section 4).

3.1 The evolution of synchronic multi-vowel systems in (Central) Chadic

In the minimal vowel system reconstructed for PCC, one phonemic and one non-phonemic vowel were distinct in terms of height, i.e. [+low] : [-low], hence we refer to it as a minimal 'vertical' vowel system. The vocalic domain, however, was populated also by syllabic allophones of approximants and of prosody-governed variant phonetic realisations of the two vowels. See Table 3.1.

Table 3.1. PCC minimal vertical vowel system and the vocalic domain

MINIMAL VERTICAL VOWEL SYSTEM		
	CENTRAL	
[-low]	*ə	non-phonemic (Svarabhakti)
[+low]	*/a/	phonemic

		VOCALIC DOMAIN		
		FRONT	CENTRAL	BACK-ROUND
Approximants	[+high]	[i] (← */y/)		[u] (← */w/)
		Y-PROSODY	Ø-PROSODY	W-PROSODY
Vowels	[-low] *ə	[ɪ ~ ɨ ~ i]	[ə]	[ʊ ~ ʉ ~ u]
	[+low] */a/	[ɛ ~ e]	[a ~ ə]	[ɔ ~ o]

In the history of Central Chadic languages, the PCC approximants */y/ and */w/ underwent diachronic phoneme splits, whereby */y/ split into /y/ and /i/, and */w/ split into /w/ and /u/; see Table 3.2a. The new vowel phonemes /i/ and /u/ often merged with the prosody-induced variants of non-phonemic schwa, i.e. [ɪ ~ ɨ] and [ʊ ~ ʉ]. Furthermore, they would occasionally undergo partial assimilation (*umlaut*) by lowering from high to mid when in adjacency to syllables whose nucleus was represented by */a/, i.e. */i/ → [e] and */u/ → [o].

The matter becomes more complicated where we have reason to assume the existence of two phonetic variants for the central non-low non-phonemic vowel schwa, namely *[ə] and *[ɨ] – at least in some East Chadic languages (Roberts 2022). Once the feature [±high] gained phonological salience as opposed to [±low] in the vowel system, possibly also *ə split into the non-distinctive variants [ə] ([-high]) and [ɨ] ([+high]) in some languages. Future research may confirm that in some languages non-phonemic schwa became identified with the features [-low,+high] and would pattern with the new high vowels /i/ and /u/ (and thus should be transcribed as IPA ɨ), while in other languages it was identified as [-low, -high] and would pattern with mid vowels (IPA ə). Once allophones and variants became phonologised in individual languages, the result would be intermediate vowel systems with between five and eight synchronic vowel phonemes. See Tables 3.2a, 3.2b, and 3.2c.

Table 3.2a. 'Vocalogenesis I'. Approximants undergoing phoneme splits, emergence of high vowels

Phoneme splits:		Approximants		
		FRONT	CENTRAL	BACK-ROUND
[±syll]	[- syll]	/y/		/w/
	[+syll]	/i/		/u/

Table 3.2b. 'Vocalogenesis II'. From two to three tongue-height distinctions and merger of non-distinctive vowel qualities under the regime of prosodies[18]

	FRONT	CENTRAL	BACK-ROUND
[+high]	*/y/		*/w/

→ [+high, -low]

	Prosodies:		
	Y	Ø	W
[-low]	[ɪ]	*ə	[ʊ]
[+low]	[ɛ]	*/a/	[ɔ]

→ [-high, -low]; [-high,+low]

[18] Shared allophones are circled.

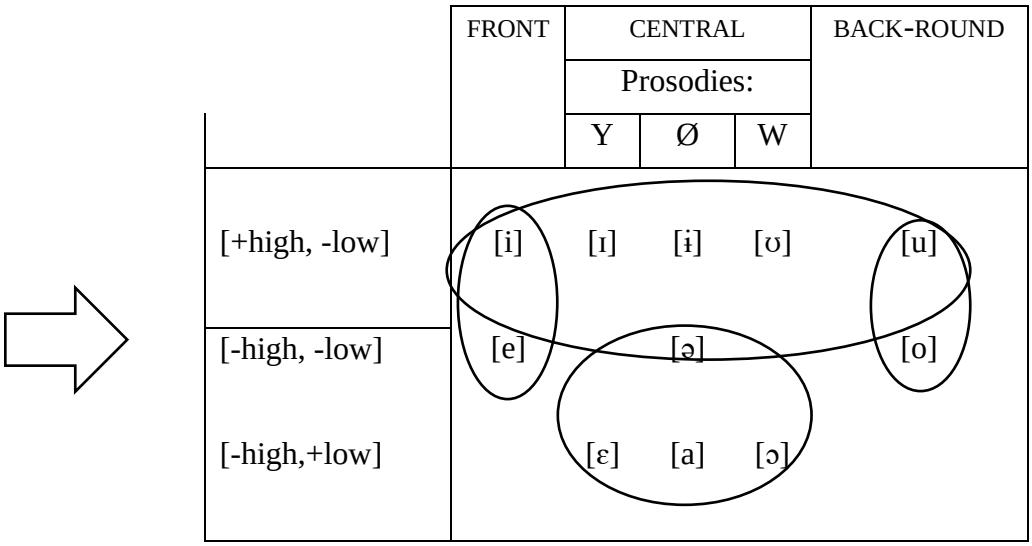


Table 3.2c. 'Vocalogenesis III'. Phonologisation of allophones and variants: The emergence of synchronic intermediate vowel systems and erosion of prosodies

	FRONT (Y)	CENTRAL (Ø)	BACK/ROUND (W)
[+high, -low]	/i/	([ɨ])	/u/
[-high, -low]	/e/	(/ə/)	/o/
[-high,+low]	(/ɛ/)	/a/	(/ɔ/)

As a practical consequence, transcriptions of 'i' and 'u' in Central Chadic languages must be scrutinised as to whether they reflect diachronic */y/ and */w/ or epenthetic schwa. As a rule, this is possible by identifying the underlying PCC root type. Chadicists, who are inclined to automatically identify the high vowels [i] and [u] with historically underlying schwa may, thereby, overlook their potential historical approximant origins. Vice versa, in other cases the high vowels may not represent syllabic allophones of */y/ and */w/, but indeed represent underlying schwa under prosodic 'colouring'.

3.2 Vowel length

Schuh (2017), agreeing with Newman (2006), considers the basic Proto-Chadic vowel system to include length distinctions with the vowel */a/, i.e. in his view there were minimally three phonemic vowels: */a/, */aa/, and */ə/ in the PC minimal vowel system. In the shared view of both Newman and Schuh and in later so-called intermediate vowel systems, the occurrence of short and long non-high vowels depended on position within the word (initial, medial, final), see Table 3.3.

Table 3.3. Chadic vowel system typology (acc. to Schuh 2017: 54, 57)

MINIMAL: 3 vowels	
	CENTRAL
HIGH	ə [i, ɨ, u]

INTERMEDIATE: 7 vowels[19]		
FRONT Final	CENTRAL Medial	BACK-ROUND Final
i	ə [i, ɨ, u]	u

MAXIMAL: 14 vowels		
FRONT	CENTRAL	BACK-ROUND
i, ii		u, uu

[19] "Word final vowels other than mid vowels are short, even in languages with a length contrast." (Schuh 2017: 55)

MID (tense)		ee		oo	e, ee		o, oo
MID (lax)					ɛ, ɛɛ		ɔ, ɔɔ
LOW	a, aa		a, aa			a, aa	

The position taken by the present author regarding the emergence of long vowels in Chadic is another one. We derive synchronic long high vowels from diachronic fusions of schwa with approximants, i.e. *əy > [ii] and *əw > [uu].[21] Likewise, *ay and *aw monophthongise and/or *aya and *awa fuse to yield phonetic surface realisations [ɛ~ɛɛ] and [ɔ~ɔɔ]. Loss of consonants in */a/__*/a/ intervocalic positions created long [aa] in phonetic surface realisation. In this way, intermediate-type vowel systems emerged quite naturally, and eventually became subject to the phonologisation of allophones. Under this approach, long vowels need not be reconstructed for the proto-language. See Table 3.4.

Table 3.4. Intermediate-type phonetic 10-/11-vowel system (with phonetic vowel length) evolving from underlying */a/, */y/, */w/

INTERMEDIATE SURFACE VOWEL SYSTEM WITH LENGTH ← UNDERLYING MINIMAL VOWEL SYSTEM		
SHORT VOWELS		
FRONT	CENTRAL	BACK-ROUND
[i] (← /y/)	(/ə/)	[u] (← /w/)
[ɛ~e] (← /ay/)	[a] (← /a/)	[ɔ~o] (← /aw/)
LONG VOWELS		
FRONT	CENTRAL	BACK-ROUND
[ii] (← əy)		[uu] (← əw)
[ɛɛ~ee] (← /aya/)	[aa] (← /aØa/)	[ɔɔ~oo] (← /awa/)

In addition, *umlaut* phenomena were triggered by *{Ca}-shaped affixes carrying the low vowel /a/. This would – optionally and language-specifically – lower the high vowels [i] and [u] to phonetic [e] and [o] in word-medial positions. Diachronic phonologisation would later create new mid vowels /e/ and /o/. See Table 3.5.

Table 3.5. Intermediate^{+} and maximal vowels systems

INTERMEDIATE^{+} SURFACE VOWEL SYSTEM WITH LENGTH					
FRONT		CENTRAL		BACK-ROUND	
[i] (← i) [e] (← i/(a)_(a))	[ii] (← əy)			[u] (← u) [o] (← u/(a)_(a))	[uu] (← əw)
[ɛ] (← ay)	[ɛɛ~ee] (← aya)	[a] (← a)	[aa] (← aØa)	[ɔ] (← aw)	[ɔɔ~oo] (← awa)

MAXIMAL SYNCHRONIC VOWEL SYSTEM		
FRONT	CENTRAL	BACK-ROUND
/i/ /ii/	(/ə/)	/u/ /uu/
/e/ /ee/		/o/ /oo/
/ɛ/ /ɛɛ/		/ɔ/ /ɔɔ/
	/a/ /aa/	

[21] This was first described for CC-A Mandara by Heide Mirt (1969) and is generally also accepted by Schuh (2017).

The above vocalogenesis scenarios encompass and plausibly sketch out the development of a wide range of different inventories of potential synchronic vowel phonemes in Chadic languages, including phonologisation of *ə and its prosodic 'colourings'. These vowel systems can be described as using between only one (like, for instance, in Central Chadic Moloko; see Bow, 1999; Friesen, 2017) and 15 phonemic oral vowels (like, for instance, in East Chadic Tumak; see Caprile, 1975); cf. Wolff (2017: 31f. Appendix).

The vocalogenesis scenarios allow to place any individual Chadic language along the path from minimal-type to maximal-type vowel system, and furthermore imply a dimension of relative chronology. The model of evolution behind the model suggests a sequential order of natural phonological processes that would eventually feed into the phonologisation of conditioned allophones of proto-language */y/, */w/ and prosody-coloured variants of both */a/ and *ə to create massively enriched synchronic inventories of vowel phonemes.

3.3 Innovative consonants

PCC is reconstructed with 26 consonants (not counting the approximants *y, *w and including a series of labialised velar obstruents). The four reconstructed prosodies create 'colouring' effects, which are likely to enlarge the synchronic inventories of distinctive consonants in modern Central Chadic languages.

- PAL may create single or whole series of palatalised consonants;
- LAB may create single or whole new series of labialised consonants in addition to the reconstructed series of labialised velars;
- NAS may create single or whole series of prenasalised obstruents;
- GLOT may create additional single glottal consonants.

Further, the frequent allophone [ʔ] is often phonologised to /ʔ/ in synchronic phonological systems of modern Central Chadic languages. Segmental fusions such as among abutting nasals and velars create synchronic velar nasals /ŋ/, /ŋʷ/. All of these are not reconstructed for Proto-Central Chadic (see Wolff, 2024).

4. Exemplifying sound changes

For characteristic diachronic changes, see the following examples (from Wolff 2022a, 2024) that illustrate various degrees of complexity of language evolution in Central Chadic.

The lexical item 'beard' (PCC ***gʷ(a)ma;** Gravina: ***ɣʷɨmɨɗʸ**),[22] for instance, allows to show that and how either no prosody, only Y-prosody, only W-prosody, and both Y- and W-prosodies may affect a PCC root to yield characteristic synchronic outputs in modern languages. The individual proto-language input can be reconstructed as either bimorphemic or trimorphemic word forms, in which the labialised initial consonant of the simple root may give rise to W-prosody, while the reconstructed suffixal augment *{-y} accounts for the effects of Y-prosody. For two of the languages in the examples, we have robust comparative evidence to reconstruct an additional archaic prefixal root augment *{ma-} that has reflexes in many present-day Afroasiatic languages.

In the Matal language, there is no prosody at work.

(4.1a) Matal (MANDARA) *agʷay* (PCC ***gʷma)**
Proto-Matal segmental input: *ma-gʷma-y
Proto-Matal Ø-prosodification output: */a-gʷa-y/

[22] Gravina reconstructs a triradical root with lexical C_3 = */ɗ/ (which frequently undergoes a change *ɗ → y), and he also reconstructs Y-prosody (indicated by raised ʸ) as independent phonological unit, which both contribute to his PCC reconstruction and to the modern word forms. The present author, on the other hand, reconstructs a biradical root, i.e. without postulating */ɗ/ in C_3 position, but rather reconstructed the presence of a highly frequent augmentative suffix *{-y} for which there is overwhelming comparative evidence. This highly frequent suffix tends to desegmentalise and prosodise (*{-y} → Øʸ) and thereby gives rise to Y-prosody, which in turn accounts for the fronting and raising of vowels in the modern languages. Both authors agree in postulating an impact of Y-prosody with this reconstructed lexical item.

*m a - g^w m a - y

deletion (2) *Ø a - g^w Ø a - y

a - g^w a - y

phonetic transcription [ag^way][23]

In the Bura language, the root-initial labialised consonant (under devoicing sound change *g^w → k^w) gives rise to W-prosody that affects the epenthetic vowel (*ə → u) in the first syllable.

(4.1b) Bura (MARGI) *kumi*
Proto-Bura pre-prosodification input: *g^wm-y
Proto-Bura post-prosodification output: *^{w}/km-y/

**g^w m - y

sound change *g^w → k^w *k^w m - y

phoneme split *k^w → k+^{w} & prosodification *k ^{w} m - y

prosody LAB

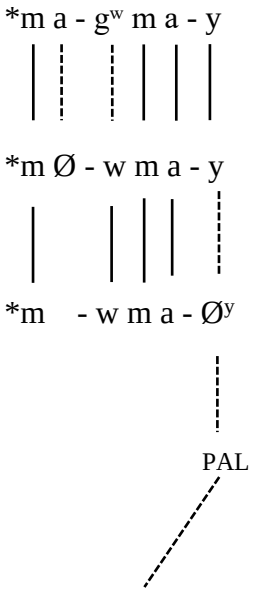
ə-epenthesis, syllabification *y → i, mapping of prosody k[ə]m-i

phonetic transcription [kumi]

In the Podoko language, the petrified suffixed marker *{-y} gives rise to Y-prosody that affects the lexical-final vowel (*a → e).

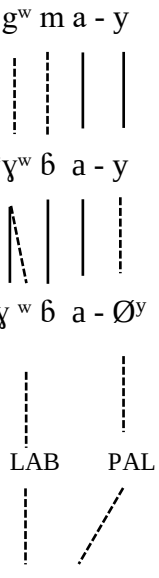
(4.1c) Podoko (MANDARA) *mume*
Proto-Podoko pre-prosodification input: *ma-g^wma-y
Proto-Podoko post-prosodification output: *^{y}/m-wma/

[23] The database contains a parallel form *ag^{w}oy* for Matal, which testifies to the optional operation of W-prosody (stemming from the labialised root-initial consonant) that changes root-internal */a/ → [o]. We therefore postulate a Proto-Matal post-prosodification double reflex */a-g^wa-y/ and *^{w}/a-g^wa-y/ stemming from the pre-prosodification input *ma-g^wma-y.



In the Kamwe-Futu language, the labialised root-initial consonant and the petrified suffixed marker *{-y} give rise to both W- and Y-prosodies that affect the epenthetic vowel in the first syllable (*ə → u) and the lexical-final vowel (*a → e).

(4.1d) Kamwe-Futu (HIGI) *yuɓe*
Proto-Kamwe-Futu pre-prosodification input: *gʷma-y
Proto-Kamwe-Futu post-prosodification output: *ʸʷ/ɣɓa/



The lexical item ‘to cut’ (PCC ***łа**) allows to observe all four hitherto identified prosodies to operate in Malgbe of the KOTOKO-NORTH group of Central Chadic. The Proto-Malgbe pre-prosodification input is reconstructed as a quadrimorphemic word based on a monoradical PCC simple root.

(4.2) Malgbe (KOTOKO-NORTH) *s’ɨnyawun* ‘cut, to’ (PCC ***łа**)
Proto-Malgbe pre-prosodification input: *ma-ɬ-ya-k^{w}-n
Proto-Malgbe post-prosodification output: *^{ʔ}ny^{w}/syawn/

	*m a - ɬ - y a - k^{w} - n
deletion; *ɬ→s; *k^{w}→ʔ+w	*m Ø - s - y a -ʔ w - n
multiple prosodification (4)	*Ø^{n} - s - y^{y} a - Ø^{ʔ} - w^{w} - n
prosodies (4)	NAS PAL GLOT LAB
multiple ə-epenthesis (2);	
mapping of prosodies	s[ə]y a w[ə]n
phonetic transcription	[s’ɨnyawun]

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