BARASANA TONE AND ACCENT * Elsa Gomez-Imbert and Michael Kenstowicz ERSS – CNRS & Universit Toulouse 2 and Massachusetts Institute of Technology 1. Introduction. Barasana is a tone language in which the Fo contour of the word is determined by autosegmental principles distributing high and low tones via the metrical grid. Another general feature is that pitch accent is a property of the morpheme in several senses. First, each lexical morpheme falls into one of two classes marked by a [H] or [HL] tones. Second, there is no contrast in the location of the tones within a morpheme (modulo initial extrametricality). Third, in various contexts one morpheme suppresses the inherent tone of a following morpheme. Fourth, there is a process of delayed association (措開alage) in which the pitch accent associated with a root is displaced to the following morpheme in certain contexts. Finally, certain morphological categories are associated with [H] or [HL] pitch accents independent of any segmental exponence. Our discussion of Barasana proceeds in ten parts. Section 2 introduces some general aspects of the Barasana language. We then turn to the pitch accent system, beginning with a sketch of the system as a whole: the basic types of pitch contrasts found in root morphemes and affixes (section 3) and the principles that derive the tonal profile of the word, given its constituent morphemes (section 4). Section 5 examines three constructions in which the pitch accent of a phrasal head is supplanted by an accent that is determined by the preceding element: the first element of a compound, a specifier or determiner, or a pronominal possessor. We then turn to pitch accent in the verb. We begin (section 6) by isolating four morphological categories in terms of different patterns of subject agreement marking. Each category has a characteristic tonal profile. We then look at two additional verbal categories柏ne marked by a polar tonal prefix and the other by a tonal suffix. In section 7 we briefly examine situations in which longer words split into two or more accentual domains. Section 8 locates Barasana with respect to the traditional tonal / pitch accent / stress typology by a comparison with Japanese. Section 9 considers alternative analyses that dispense with the metrical grid or the lexical pitch accent. The paper concludes with a summary of the results in section 10. 2. Background. Prior to the analysis of Barasana tones and accent, we give some background about the language and the people who speak it. Barasana is the name given to one of the groups belonging to the eastern branch of the Tukanoan family. Their actual name is jeb –baca 'Jeb 釤s people' (from their mythical ancestor the jaguar Jeb); also –had –ˊr which is a jocular name.1 The Barasana live in the Piraparana river basin in the Vaup閤 Colombian territory of the Northwest Amazon. There are some 500 Indians whose father's language is Barasana; but the number of potential Barasana speakers is higher because individuals whose mother担 language is Barasana are not considered Barasana people. Barasana is a member of the well-known exogamic and multilingual Vaup system, in which each group is defined as patrilineal, patrilocal, and uses the father's language as a marker of identity. Due to linguistic exogamy, an individual (male or female) can only marry someone whose father担 language is different from his/her own. To mark one担 identity, an individual must always use his/her father担 language. Thus when women marry and go to live in the husband担 community, they continue to use their father担 language even when they address their husband and children. The languages involved in this practice are Eastern Tukanoan; exceptionally, a relation with Arawakan groups is conducted at the border of the Tukanoan territory.2 Fieldwork has been done since 1983 by the first author during several four-to-six week stays in the Piraparana area. Barasana men and women with Tatuyo mothers were chosen preferentially as language consultants because the language used in data gathering was Tatuyo, a neighboring language previously studied by Gomez-Imbert (see Gomez-Imbert 1982). This approach guarantees the reliability of our interpretation, especially of the tonal prefixes, which have systematic segmental correspondences in Tatuyo (see section 6). Extensive phonological and morphological data and a non-linear analysis of Barasana are presented in Gomez-Imbert (1997a). See Jones & Jones (1991) for an approach to Barasana syntax. Several characteristics of Barasana are relevant to understand what follows. Nasality is not a phonemic but a morphemic feature.3 A survey of the Barasana lexicon shows that the canonical template for roots is bimoraic, a shape inherited from the minimal word. Segmental processes of vowel gemination and epenthesis are recruited to enforce a bimoraic shape. Barasana is a language with two lexical classes: nouns and verbs.4 Most nominal roots are free morphemes and hence can constitute a word in isolation; verbal roots must be completed by an inflectional suffix and hence are bound morphemes. Suffixes in both nouns and verbs are either monomoraic or bimoraic. Nominal words display suffixes traditionally called classifiers, which constitute a concordial system appearing in all nominal constituents. The classifiers lie at the boundary between grammatical and lexical categories: segmental and tonal processes are sensitive to their moraic weight such that the bimoraic ones behave like roots while the monomoraic ones behave like suffixes. The basic word order in the clause is OVS, a typological rarity. We now give an introduction to the phonology and our transcription. The Barasana segmental inventory appears in (1). There are six vowels (the i sounds like the Japanese high back vowel), a series of voiced and voiceless plosives, two sonorants, and one laryngeal. (1) a. vowels i i u e a o [high] + + + – – – [back] – + + – + + [round] – + – + – + b. consonants labial coronal [+anterior] coronal [–anterior] dorsal laryngal [–sonorant] [–voice] [–continuant] p t c k [+continuant] –voice] b d j g [+sonorant] [+voice] [+continuant] w r There is no segmental opposition between oral and nasal segments. The lexicon exhibits contrasts only between entirely oral (2a) and entirely nasal roots (2b). The nasal autosegment of the roots in (2b), represented in the phonological transcription by a nasal tilde preceding the segmental sequence, nasalises all the voiced segments vowels, sonorants, and plosive consonants of the root. The nasal allophones of the voiced plosives appear in the phonetic transcription: [m] for /b/, [n] for /d/, [坋 for /j/ and [N] for /g/; nasalization of vowels and sonorant consonants is indicated by an underscript. Voiceless plosives are transparent to nasal spreading. Finally, all plosives are realised geminated when morpheme internal: [p:], [t:], [c:], [k:], [b:], [m:], [d:], [n:] [j:], [:], [g:], [N:]. A few minimal pairs are cited below. As we are concerned with tone and accent in this paper, nasalization will be transcribed morpho-phonemically. (2) a. [–nasal] roots b. [+nasal] roots b後–r 'to swim' b後–r 'to pour powder with hands' [ba@a@re@] [ma@絅@郮褶@郮 b 贚 –r 'to blink' `bib –r 'to suck' [bi@b:i@re@] [mi郷:i@郮褶@郮 ti –r 'to sew `t碟–r 'to stoke the fire' [ti@a@re@] [ti@絅@郮褶@郮 uk –re 慮 draw/write `bak –re o look for [uk:a@re] [ma郏:a@郮褶郮 Suffixes are [+nasal] and [–nasal] (like roots), as well as [Onasal]. The [+nasal] specification of a root nasalises a [Onasal] suffix (2b); a [–nasal] specification blocks the progressive spreading of the [+nasal] feature. The following generalizations characterize the relation between nasal properties and morphemic classes and moraic structure: a) roots are bimoraic with stable (膩asal] values; b) bimoraic suffixes are also stable in nasality, with four exceptions which are [Onasal] and take the –VCV structure: the verbal optative –ato, and the nominal suffixes 杧ka (diminutive), –Vro (augmentative), and –Vri (inanimate plural); c) monomoraic suffixes are [+nasal] or [Onasal], with only two [–nasal] exceptions: the classifiers –bi (tubular) and –bo (heap). See Gomez-Imbert (1998) for discussion. 3. The Basic Pitch Accent System 3.1. Roots. Barasana morphemes contrast lexically for two different pitch accents: [H] and [HL]. In addition, a morpheme may unpredictably begin with a low pitched mora but only when it appears at the left edge of the word or accentual domain. Rather than expand the inventory with [LH] and [LHL] melodies, we shall treat these initial low-pitched moras as 搢xtrametrical (Hayes 1981). Given that the tones are realized through metrically prominent positions, the extrametrical moras will never attract them. We indicate the extrametrical moras by angled brackets. In our transcriptions the acute accent marks a high-toned mora while low-toned moras are unmarked. An unmarked mora at the beginning of the word is extrametrical. When a [HL] accent is realized on the final mora of a root, the vowel is optionally lengthened (not reflected in our transcriptions). Nouns are cited in their bare form (where possible some are bound morphemes that require a classifier suffix). Verb roots are bound morphemes that require an inflection; we cite them in the completed aspect with the 3 sg. masc. suffix –bi or the inanimate –bi (the inflection is not reflected in the glosses: bac –ˊb 慮ance instead of 憼e danced , –閧 –b 惷oze instead of 憾oozed). (3) a. CVCV: H: ┘j臸 慇eer , ┘j臸 'night', g臸g 'white people', k鶣 慇haman , w鶣 惷anpipe ; w鶣 –ˊb 憂ibble , `b鵹 –ˊb 慲o upstream , w鹻 –ˊb 惷e awake HL: `b鵹i 惼erd/pet , `c鶢 慇ineapple , `h鶣 慘naconda , w鶣i 慓ish (Geophagus sp.) , `r飽i–o 慃oman ; `b鵹i–`bi 惷uck , j臸e–`bi 慮under , j醷 e–`bi 慯hake H: rac 慮oucan , buj 'cotton', `bac 'people', cot 慫ot , `bid 慫obacco ; bac –ˊb 慇ance , cij –ˊb 惴ipple HL: wec 慫apiwinc garden , wek 慬carrot (Amazonas sp.) , `gah 慖namou sp. , coh 慫our , rik 惸ruit ; bec –`bi 慶hoose , bok –`bi 惷eet , ked –`bi 慓all b. CVV: H: r鵺 惽lood , t後 惼rass , j訐 慅aguar , `b絁 慉alt , b碟 慇epper ; j –ˊb 慡wallow , r 葵–ˊb 慮hrow , t篊–ˊb 慫otect , `c後–ˊb 慖ntroduce HL: `k絤 慉nioc , r絤 慉ap , b閧 慇acred flute/ancestral , b閧 慫g. sp. , `h鶣i–i 慇ammock ; g鶣–`bi 惷e afraid , k鮬–`bi 慉sh , j鶣a–`bi 慏ait , b鵡e–`bi 慖wim H: go 慫lowers , wa 慫g杧ish , ba 'path', bi 慫louse , wa 慫onkey (Callicebus sp.) ; ro –ˊb 慐ook , ba –ˊb 慇at , bu –ˊb 慇earn , cu –ˊb 慼red red HL: wa 慫g. sp. , hu 慲ainy season , wi 慘ouse , ko 慪ourds , ca 慏atfish (Rhamdia sp.) ; bi –ˊb 慄lose , `ba –ˊb 慌ove , ba –ˊb 慌end , ba –ˊbi 慔wing c. vCV: H: 糟 慇and , 蓆 'snake', `鶙 'avocado', `鶣 each palm (Guilielma gasipaes) ; 閧 –ˊb 慏atch up ; 閧 –ˊb 惷oze HL: `鵧u 慓ish (Hoplerythrinus sp.) , 閧i 惷chre , `鵻i–i 慷an ; `臸i–`bi 惼ring , `鶣–`bi 惷un H: uk 慳ava , ok 慬anguage , ok 'liquid', ik 慱edicine ; ot –ˊb 慫lant , eh –ˊb 慖ocative , uk –ˊb 慥rive , uk –`bi 惷rive , wa –ˊbi 慫lay , ek –ˊbi 惼eed , id –ˊbi 慖 rink , ig –ˊbi 慓inch d. VV: HL: 舫 慫ossum ; 鯬–ˊbi 慼ate H: ┘i 慳aterpillar HL: ┘i –ˊbi 慙ee , i –ˊbi 慳ater , ┘o –ˊbi 慥ake a cord The roots in (3) are listed in terms of their order of frequency in the lexicon. The most common shape is CVCV followed by CVV, then VCV, and finally VV (there being just a handful of the latter). The frequencies can be described in terms of the relative number of violations of two universal constraints: Onset (penalize syllables without a consonantal onset) and *VV (penalize syllables with a long vowel or diphthong; Rosenthall 1997). The ubiquitous CVCV violates neither constraint while the rare VV violates both. The prevalence of CVV over VCV would indicate a ranking (in the sense of Prince & Smolensky担 (1993) Optimality Theory) of Onset over *VV. It would be interesting if there were any evidence internal to the grammar of Barasana for this ranking. We leave this as a question for future research. In terms of tone melodies, the [H] pitch accent is more prevalent in nouns. Of some 500 nominal roots, only about 100 fall in the [HL] class and of these the majority have an extrametrical initial mora. For verbs, on the other hand, [HL] predominates; also, most verbs (both [H] and [HL]) have an extrametrical initial mora. The language has a much more limited number of trimoraic stems, as indicated in (4). (4) (C)VCV(C)V: H: k開羮 慇loth (Bradypus sp.) , `賴輪 慇ardines , p醷醷 慮eprog (Hyla sp.) , `鶣e 慮eprog (Hyla boans) ; c鯺艷–ˊb 慶omb , g鶣á–ˊb 慇rap HL: b閧oa 慔eees , `b鶣oa 慡wifts/swallows , w鶣i 慯catfish sp. , `c賴i–o 慷eg. (Monopteryx angustifolia) , `g鵥aja 慯ed face paint (Bignonia chica) , `k鶣oa 慯attle ; k鮬i–o 慾ickle , `g鶣eo–ˊb 慺rive back H: wad慾 慔orcupine , `rit碟 慯onkey (Cacajao calvus rubicundus) , `rig飽 慼lea , hog鰵 慬utterfly H: wad慾 慇alm beetle larvae (Rhyncophorus palmarum) , `tib鶣 憂orthern Amazon red squirrel (Sciurus igniventris) , `buh鵶u 慭un, moon , kuj醷鵺 慬lack-headed parrot (Pionites melanocephala) , hit鶣i 慱ird, tyrant flycatcher , pap醷e 慮eprog (Hyla sp.) ; ric觎–`bi 慛eel sick , bat鰵–`bi 慛hare , wac舫–`bi 慹xchange The presence of HLL and the absence of HHL contoured stems suggests that the pitch accents associate to root morphemes from left to right instead of from right to left. 3.2. Suffixes. Suffixes in both nouns and verbs are either monomoraic or bimoraic. In verbs the bimoraic suffixes precede the monomoraic ones, which are largely confined to the right edge of the word where they mark various inflectional categories. Below in (5) we list examples of the various types of nominal suffixes; they are attached to the noun stem in the order classifier, number, evaluative, case. As we shall see, the monomoraic suffixes appear as high toned after a [H] root and as low toned after a [HL] root. They could be underlyingly unspecified for tone or [L]. We know of no conclusive evidence internal to Barasana that decides between these alternatives. For convenience we will treat them as unspecified. (5) classifiers: –i /gi / ki 慱asculine , –o/go/ko 慺eminine , –a/ga/ka 慲ounded , –bi 慮ubular number: –a 慴nim. pl. , –醷ri 慼nanim.pl. , –ˊbi 慒ingulative evaluative: –臹a 慏iminutive , –醷ro 慉ugmentative case: –re 慬bjective , –hi 慙ocative In sum, Barasana roots contrast as [H] vs. [HL]. In addition, the initial mora of a root can be unpredictably extrametrical but only at the beginning of the phonological domain. Bimoraic suffixes also contrast as [H] vs. [HL]. Most monomoraic suffixes are toneless in the sense already described, but there are some final verbal ones which introduce a HL melody (see 6.4). 4. Word Accent 4.1. The Basic Pattern. We now consider the pitch accent of the phonological word that emerges when roots are combined with suffixes. In the simplest case there are four possible combinations: the root can be [H] or [HL] and the suffix can be or [HL]. Examples for the nominal inflection are given below in (6), where the [H] noun k鶣 'shaman' and the noun `b鵹i 'bird, pet' are combined with the toneless objective suffix –re and the [HL] diminutive –臹a. (6) [H] + : ┌kubu+re/ –> `k鶣 –r 'to the shaman' [H] H+HL: ┌kubu+aka/ –> `k鶣 –臹a 'shaman' dimin. [H] [HL] HL+ : `b鵹i+re/ –> `b鵹i–re 'to the bird, pet' [HL] HL+HL: `b鵹i+aka/ –> `b鵹i–aka 'little bird' [HL][HL] The object suffix –re assimilates the final tone of the preceding root. The diminutive –臹a appears as –aka after a [HL] root. The paradigms in (7) below give a fuller picture, exemplifying words that combine two or three suffixes. They are built from the plural (杧 animate and –醷ri inanimate), followed by the diminutive –臹a, followed in turn by the objective –re. We also provide examples of the extrametrical roots goh 'hole' [H] and wek 'parrot' [HL]. It is apparent that a [H] root always suppresses the tones of the following suffix. A [HL] suffix behaves the same way, turning a following [HL] suffix to [L]: /h +醷ri+臹a+re/ –> goh –開i–aka–re. (7) ┌kubu/ –> `k鶣 'shaman' [H] /┌kubu+re/ –> `k鶣 –r 'to the shaman' [H] /┌kubu+aka/ –> `k鶣 –臹a 'little shaman' [H] /┌kubu+a+aka+re/ –> `k鶣 –臹a–re 'to the little shamans' [H] /┌bidi/ –> `b鵹i 'bird, pet' [HL] /┌bidi+re/ –> `b鵹i–re 'to the bird/pet' [HL] /┌bidi+aka/ –> `b鵹i–aka 'little bird/pet' [HL] /┌bidi+a+aka+re/ –> `b鵹i–a–aka–re 'to the little birds/pets' [HL] [HL] /he/ –> goh 'hole' [H] /he+re/ –> goh –r 'to the hole' [H] /he+aka/ –> goh –臹a 'little hole' [H] [HL] /he+aka+re/ –> goh –臹a–re 'to the little hole' [H] [HL] /he+Vri+ aka+re/ –> goh –開i–aka–re 'to the little holes' [H] [HL] /ko/ –> wek 'parrot' [HL] /ko+re/ –> wek –re 'to the parrot' [HL] /ko+aka/ –> wek –aka 'little parrot' [HL] /ko+a+aka+re/ –> wek –a–aka–re 'to the little parrots' [HL] 4.2. Analytic Preliminaries. There are a variety of ways in which these data can be described. After experimenting with different tonal and metrical analyses we have concluded that Barasana can be more adequately described in terms of both tones and metrical structure rather than in exclusively tonal or exclusively metrical terms (see section 9). There are phenomena whose elucidation requires reference to both aspects. Nor can the tonal vs. accentual dimensions be neatly segregated into different stages of the derivation. The key observation that underlies our analysis is that the accentual possibilities for the entire word mirror those of the morpheme in Barasana. Modulo extrametricality at the left edge, Barasana words are characterized by a single rise in pitch followed by a possible fall. Stated differently, there is just one peak per word/domain the hallmark of a pitch accent system. Furthermore, when there is a drop in pitch, it coincides with a [HL] pitch accent contributed by one of the word担 constituent morphemes. It therefore seems natural to view the peak of the word as deriving from the projection of one of the lexical pitch accents. The metrical grid of Liberman & Prince (1977) is ideally suited to characterize this culminativity (see Hayes 1995 and Halle & Idsardi 1995 for recent formalizations): by parsing abstract positions (moras in Barasana) at successive levels, one position of the word becomes the most prominent. The pitch accent associated with this metrical prominence then defines the core Fo contour for the entire word. On this view the tonal contours are realized through the metrical grid. This will prove crucial at several points in the analysis. The other assumption underlying our analysis (essentially an application of Postal's 1968 Naturalness Condition) is that if contrasting accent classes correlate with consistent phonetic differences, then these phonetic differences should constitute the basis for distinguishing the accent classes in the input lexical forms. Consequently, we represent the two accent classes in terms of [H] vs. [HL] tonal melodies rather than in terms of more abstract distinctions such as [盇accent] (Gomez-Imbert 1997a) or [眄cyclic] (Idsardi & Kim 1997). Before launching into the formal analysis, it would be appropriate to survey the data from a pretheoretical perspective. The following observations are relevant. First, the mora is the tone bearing unit rather than the syllable. Second, the minimal point of tonal contrast is between : vs. [HL] tonal profiles for lexical and some inflectional morphemes. Third, there is lexically determined extrametricality at the left edge of the word (or domain). Fourth, for morphemes in the [HL] class, the point of pitch drop is predictable (modulo extrametricality). Morphemes containing three moras that belong to the [HL] class have a surface HLL contour (rather than HHL). This suggests that metrical prominence is associated with the left edge of the morpheme. Barasana shares the first and third features with Yaqui (Delmers, Escalante & Jelinek 1999). In both languages the mora is the tone-bearing unit, a syllable being either monomoraic or bimoraic. In both, extrametricality is a lexical feature that affects the word at the left edge. These characteristics are interesting with respect to Hayes (1995) restrictions on extrametricality that exclude the mora as a possible extrametrical constituent and identify the left edge as the marked one. For the paradigms in (7) that combine several morphemes and hence several pitch accents, which one is projected as the accent of the entire word? The first generalization is that a [HL] pitch accent beats out a simple [H]. Evidently a sharp pitch protrusion is more phonetically salient. This makes sense crosslinguistically, where [HL] seems to be associated with greater prominence. It is the pitch accent selected by systems as diverse as Basque (Hualde 1999), Tokyo Japanese (Haraguchi 1977), and Kyungsang Korean (Kenstowicz & Sohn 1997). [HL] is also the pitch accent associated with focus in many languages (e.g. Hungarian (Rosenthall 1992), Italian (D杅mperio 1997)). Ayutla Mixtec (Pankratz & Pike 1967, cited in van der Hulst & Smith 1988) shows the affinity between a [HL] tonal sequence and an accent in a particularly clear fashion. In this language stress is assigned 揾o the first HL sequence if present; otherwise, to the first ML sequence; otherwise the first H; otherwise the first syllable (van der Hulst & Smith 1988:xv). The second generalization is that when there is more than a single [HL] pitch accent in the Barasana word, then the first one wins out. The preference for leftmost accent seems crosslinguistically common; perhaps it reflects a phonologization of downstep whereby second H of HLH sequence is typically realized at a lower Fo value than the first H. Finally, once the most

prominent mora in the word is calculated, its pitch accent overrides all the others. This accent forms the core of the F0 contour for the entire word; the periphery of the contour arises via familiar autosegmental principles of tone spreading. The metrical grids that underlie Barasana accent can be characterized in terms of structure building rules or in terms of a ranking of Optimality-Theoretic constraints (Prince & Smolensky 1993). As far as we can tell, most of the analytic work is done by the autosegmental/metrical representations themselves. Barasana accent does not appear to bear in any crucial way on the choice between these two models of phonology. For the sake of convenience and familiarity, we cast the analysis in terms of rules. We follow the formalization of Halle & Idsardi (1995) where metrification proceeds via the insertion of left and right facing grouping operators and the projection of heads. In our analysis the Barasana grids are constructed at several levels. The essential ones are the morpheme and the word. At the morpheme level moras are projected from the phonemic string to form the bottom line of the metrical grid line-0 in Halle & Vergnaud (1987) (rule 8i). Following a suggestion of Morris Halle (personal communication), we express extrametricality in Barasana as the deletion of a word-initial line-0 grid mark in a lexically determined class of morphemes (8ii). The next rule (8iii) arises from setting the parameters associated with Idsardi 扨 (1992) Edge-Marking Rule that inserts left or right brackets to the left or right side of the leftmost or rightmost grid mark. Barasana sets these parameters to 挓eft , a homogeneous setting that is quite prevalent crosslinguistically and that underlies initial accent. Finally, the morpheme-level constituents are left-headed and project to the next line of the grid (8iv). It is these prominent positions that attract the pitch accents (8v). (8) morpheme-level: i. project moras as line-0 elements ii. delete a line-0 grid mark in the context #_ (lexically restricted) iii. Edge-Marking: insert a left bracket to the left of the leftmost element (LLL) iv. heads left; project head to next level of grid (line-1) v. associate the morpheme挓 pitch accent to the prominent moras. We provide the following illustrative derivations. (9) ˇkubu ˇbidi gohe -aka [H] [HL] [H] [HL] L0 * * * * * * * * ˇkubu ˇbidi gohe -aka [H] [HL] [H] [HL] projection (8i) L0. (* gohe [H] deletion (8ii) L0 (* * (* * (* * ˇkubu ˇbidi -aka [H] [HL] [HL] E-M: LLL (8iii) L1 * * * * L0 (* * (* *. (* (* * ˇkubu ˇbidi gohe -aka Head: L; (8iv) | | | | associate the tones (8v) [HL] [H] [HL] At the word level (line-1), it is the leftmost mora associated with a [HL] pitch accent that becomes the locus of prominence. When the word combines several morphemes from the [H] class, we cannot tell which one projects its pitch accent to the word level. Since most of the parameter values are set to "Left" for Barasana, it is a natural analytic decision to conclude that the leftmost [H] projects. If we take this step then the Barasana accent pattern is isomorphic to that of Khalkha Mongolian, which stresses the first long vowel and otherwise the first vowel of the word. From this perspective the Barasana [HL] pitch accent is the counterpart of the Khalkha heavy syllable in attracting prominence. We propose the same rules for Barasana as Halle & Idsardi (1995) do for Khalkha Mongolian. See Zoll (1996) for an OT alternative. The first rule (10-i) inserts a left bracket to the left of 撓eavy moras i.e. ones associated with a [HL] pitch accent. The next rule (10ii) inserts a right bracket at the end of the entire word. If heads are Left (10-iii) then the initial element of this line becomes the point of prominence when [HL] is absent from the word. Finally, to account for the fact that the leftmost of the 撓eavies is the peak of the word another round of metrification (line-2) is called for: it enhances the leftmost element by placing a bracket before it and making it the head of the resultant constituent (10 iv-v). These successive metrifications culminate in a single prominent mora for the entire word. It is this element that retains its pitch accent while the others are suppressed (10-vi). It then spreads (10-vii) autosegmentally to all the other vowels (except the extrametrical mora at the left edge of the word). (10) word level: line-1 i. insert a left bracket to the left of 撓eavy elements——i.e. those associated with a [HL] pitch accent ii. insert a right bracket to the right of the rightmost element (RRR) iii. heads left; project heads to next line line-2 iv. Edge-Marking: insert a left bracket to the left of the leftmost element (LLL) v. heads left; project to next level of the grid tonal vi. delete tones not associated to the most prominent mora of the grid vii. spread tones to toneless moras (except extrametrical mora at left edge of the word) The following derivations for ˇk鵝a ˀ-çöa ˀshaman-dimin. , b鵗ai-aka ˀbird-dimin. , and goh -r 感ole- objective illustrate how the rules of (10) derive the word-level F0 contours. (11) L1 * * * * * * L0 (* * (* * (* *. (* (* ˇkubu+aka ˇbidi+aka gohe+re | | | | | | [H] [HL] [HL] [HL] [H] [HL] L1 * (* (* * L0 (* * (* * (* * ˇkubu+aka ˇbidi+aka inapplicable accent 撓eavy moras (10i) | | | | | | [H] [HL] [HL] [HL] L2 * * * * L1 * (*. (* (* * (* * (* *. (* (* Head: L (10-iii) ˇkubu+aka ˇbidi+aka gohe+re | | | | | | [H] [HL] [HL] [HL] [H] [HL] L3 * * * L2 (* (* * (* * (* * (* * tones (10v); L0 (* * (* * (* *. (* (* spread tone (10-vii) ˇkubu+aka ˇbidi+aka gohe+re \ \ | / / / / | [H] [HL]

5. Accent Replacement. In this section we describe the accentual alternations in three different grammatical constructions in Barasana. In each one the pitch accent associated with a stem morpheme is suppressed when in construction with an element on its left. The constructions differ in terms of the tonal outcome of the second element. First, in compounds the tone of the first stem predominates and spreads to the right. Second, certain determiners induce a [HL] pitch accent on the following noun. Finally, in constructions headed by a pronominal possessor the tone of the pronoun is replicated on the noun. 5.1. Compounds. Compounding is a very productive process in Barasana. It operates in both the nominal and the verbal morphology. Given that there are four possible accentual contrasts ([H] vs. [HL] and [版xtrametrical]), there are sixteen possible combinations of stems in a compound which we illustrate in (16–19). The first two columns indicate the surface form of the two members of the compound while the third column shows the pitch accent contour of the compound as a whole. (16) N1 is [H]: a. r碌 醢 -> r碌 醢 [H] [H] river snake snake (Bothrops atrox) b. ˇb鞄 - cot ˇb鞄 + c鞱 [H] [H] [H] metal-PL cooking pot metal cooking pot c. ˙鞄i b鞄i 鞄 +b鞄 [H] [HL] [H] Guilielma gasipaes bird blue-gray tanager (Thraupis episcopus) d. h葵 ˙git -a h葵 +ˇg瑠 - [H] [HL] [H] fire rock/stone-CL flint stone (17) N1 is [H]: a. guh ˇg鵝 -> guh + ˇg鵝 [H] [H] [H] teeth fallen trunk gum b. ˇre ok ˇre + 偶 [H] [HL] [H] Mauritia flexuosa liquid Mauritia drink c. wa ˇk鵝a wa + ˇk鵝 [H] [HL] [H] fish glutenous stew glutenous fish stew d. cit ut鵗 cit + 鵝碌 [H] [HL] [H] earth wasps wasps sp. (18) N1 is [[HL]]: a. h閅 j斿 -> h閅 + jai [HL] [HL] [HL] ancestral jaguar shaman b. ˇk釤 ˇk釤 + jece [HL] [HL] [HL] manioc peccary peccary Tayassu tajacu c. ˙鵝u ˇk鵝a ˇ鵝u + ˇkuba [HL] [HL] fish sp. glutenous stew glutenous fish sp. stew d. h閅 rik h閅 + rika [HL] [HL] [HL] ancestral fruits tree fruits (used in ancestor rituals) (19) N1 is [[HL]]: a. wec ˇk鞄 -> wec + ˇkode [HL] [H] manioc garden woodpecker crimson-crested woodpecker (Campephilus sp.) b. gih tut gih + tutu [HL] [H] vegetable pitch stump lighting post c. ˙git -a ˙h鞄o ˙git -a+ˀhido [HL] [HL] rock/stone anaconda rock anaconda d. ˙git buh ˙git + buha [HL] [HL] rock/stone dove cock of the rock The simplest analysis is to say that between the morpheme and the word level a metrification at the stem level takes place in which the accent of the first element of the compound predominates. We may achieve this in two ways. First, an application of the LLL variety of Edge-Marking plus Head=L will enhance the accent of the first member of the compound: E-M: LLL, head = left. Then when accented suffixes are integrated to calculate the word-level accent, their prominences must be equalized to the level of the head of the compound (a standard feature of compound accent see Chomsky & Halle 1968). This permits a suffixal [HL] to predominate over the stem by the regular rules (see below). Alternatively, the accent associated with the second member of the compound could be suppressed. We prefer the first analysis for a couple of reasons. Adding a level of prominence rather than deletion of prominence is the typical compound accent rule found in English, German, and other languages. Second, LLL, Head=L is a rule that already operates at other levels of the grid in Barasana. On the other hand, deletion of prominence from the second member of the compound is a more arbitrary change. For example, nasality (also an autosegmental feature of the morpheme in Barasana) is stable in compounds (Gomez-Imbert 1997a). The compound rule must apply before the word level. This is shown by examples in which the second member of the compound has a [HL] pitch accent. When combined with a [HL] suffix such as the diminutive, it is the pitch accent of the diminutive that is projected to the word level. This follows if the stem is metrified first; the compound rule promotes the pitch accent of the first member leaving the [HL] of the second member at a lower metrical level and hence ineligible to participate in the word-level metrification. The following derivation of t鵝o-ˀb鞄 -çöa 惯ird sp.-dimin. illustrates this point. (19) morpheme level: taa ˇbidi aka [H] [HL] [HL] L1 * * * L0 (** (** (** taa ˀbidi aka | | | [H] [HL] [HL] compound level: L2 * L1 (* * * L0 (** (** (** taa ˀbidi E-M: LLL | | Head = L [H] [HL] Head the L [H] [HL] word level: L2 * equalization L1 (* * * L0 (** (** (** taa ˀbidi aka | | | | [H] [HL] L3 * L2 * (*) heavy syll L1 (* * E-M: RRR L0 (** (** Head = L taa ˀbidi aka | | | [H] [HL] The derivation is completed by the tonal rules deleting pitch accents of nonprominent moras followed by spreading of tones to toneless moras. 5.2. Post-accentuation. In some languages the addition of an enclitic triggers the insertion of a boundary accent. The Latin example l :mina 惯hreshold but li:min #que 惯nd thresholds is perhaps the best-known instance of the phenomenon (see Mester 1994, and Halle & Idsardi 1995 for recent discussion). Barasana nouns exhibit a parallel phenomenon triggered by certain specifiers that modify the following head a bimoraic classifier or a nominal root. They induce a [HL] pitch accent on the first mora of the head which, being the leftmost accent, overrides the head挓 inherent accent. In effect, these elements are post-accenting. Relying on the notation introduced by Idsardi (1992), they can be represented as in (20). (20) * * (* * (** (* ** (**(| | | | | | | | ˇ鮤 -b 偬 b -h - 偬dentical to 惼 haped 壺ne 偬hich In (21) we show these specifiers in combination with the bound classifiers - ˇhai 惼lade , -kaa 惼ow , and -bedo 惼ow and with the free-standing stems wec 惼anioc garden (HL cf. wec -re 惼anioc garden-obj.), cot 惼ooking pot (H cf. cot -r 惼ooking pot-obj.), and ˇw癤e 惼ishing (H cf. w癤e-r 惼ishing-obj.). (21) a. ˇ戴 - 偬dentical to ˇ戴 -ˇh醆e 惼lade ˇ戴 -w閅e 惼anioc garden ˇ戴 -k醆ae 惼ow ˇ戴 -c醆i 偬ot ˇ戴 -b閅o 惼ow ˇ戴 -ˇw癤e 惼ishing b. ruh - 偬haped ruh - ˇh醆e 惼lade ruh -w閅e 惼anioc garden ruh -k醆ae 惼ow ruh -c醆i 偬ot ruh -b閅o 惼ow ruh -ˇw癤e 惼ishing c. koh - 壺ne koh -ˇh醆e 惼lade koh -w閅e 惼anioc garden koh -k醆ae 惼ow koh -c醆i 偬ot koh -b閅o 惼ow koh -ˇw癤e 惼ishing d. di - 偬hich di -ˇh醆e 惼lade di -w閅e 惼anioc garden di -k醆ae 惼ow di -c醆i 偬ot di -b閅o 惼ow di -ˇw癤e 惼ishing For this analysis to go through, the first constituent must be exempted from the morpheme level LLL Edge-Marking rule (8iii). The generalization seems to be that there is just one prominence specification per morpheme (just like one pitch accent). The first constituent realizes it's prominence on the following head but the pitch accent itself is a property of the former element. We must also generalize the rule (8v) that associates pitch accents with prominences to the word-level. This is crucial since the [HL] introduced by these post-accenting morphemes becomes the pitch accent of the entire word. The derivations in (22) illustrate the proposed analysis. In (22a) we show a head cot 惼ooking pot . While this morpheme belongs to the lexical class that triggers the extrametricality rule (8ii) that deletes its line-0 grid mark, that rule does not apply here because it is not at the left edge of the determiner. Rather the specifier koh - 壺ne undergoes this rule. The grid mark projected from the first mora of cot becomes metrified by the right-facing bracket associated with the determiner. The same equalization procedure we saw operating in compounds applies here as well ensuring that the determiner has the same prominence level as the head. The [HL] pitch accent of the determiner will be attracted to this prominence. The word level rules already established then project this accent as the F0 signature for the entire word. (22) L1 * * L0. *(* .* ((* * koho coti koho ˇwabe | a. [HL] [H] b. [HL] [H] L1 * * * L0 . *(* (* .* ((* * koho coti koho ˇwabe equalization / / | [HL] [H] [HL] [H] association of tones In (22b) we see a case where the determiner挓 pitch accent is assigned to the position that supports the pitch accent of the nominal head. Being [HL] the determiner will overshadow the head and so we cannot determine the fate of the head挓 inherent pitch accent. 5.3. Accent Copy. As we noted earlier, the [H] vs. [HL] opposition is one of the two dimensions of accentual contrast for Barasana lexical items (the other being left-edge extrametricality). The [H] vs. [HL] contrast is also recruited by the morphology to mark certain inflectional categories. Scrutiny of the pronominal paradigms in (23) below reveals that all first and second person, [+person] pronouns, share in common a [H] while all third person, [−person] pronouns, are [HL]. (23) ji ji ˇb醢 ˇbi bi [H] [H] [H] [H] [H] 惯u 偬e (exclusive) 偬e (inclusive 惾ou 惾ou pl. ˇ釤 ˇ釤a ˇc偬 t偬 t釤 [HL] [HL] [HL] [HL] [HL] 感e 惼hey 惽e 惼hat sg. 惼hat pl. Deictics display a similar opposition: those marking referents present in the vicinity of participants in the speech act are [H] while those marking referents that are absent from the vicinity of the speech act are [HL]. The deictics (unlike the pronouns) are bound morphemes. (24) ad - ad -w斿 cf. wi -re [H] [H] 惼his (proximal) 惼his house 惾ouse-obj. - -w斿 [HL] [HL] 惼hat (distal) 惼hat house t - t -wii [HL] [HL] 惼hat (anaphoric) 惼hat house we spoke of gah - gah -wii [HL] 壺ther 壺ther house In Barasana there is a curious phenomenon whereby the [H] vs. [HL] opposition for pronouns supplants the tone of the nominal root in possessive constructions headed by a pronoun (24), a process Gomez-Imbert (1997a) calls 挸ccentual copy . (25) Pronoun Noun ˇb醆 ˇk鵝 -> ˇb醆 ˇk鵝 壺ur shaman ˇ醆 bab -r -> ˇ醆 bab -r 壺ur friends [H] [H] [H] [H] [H] b醢 bab -r -> b醢 bab -r 壺ur pet [H] [H] [H] ˇb醆 ˇb鞄i -> ˇb醆 ˇb鞄 壺ur pet [HL] [HL] ˇb醆 wih -bo -> ˇb醆 wih -b ˀour tray' [H] [HL] [H] heir shaman [HL] [H] [HL] ˇ鞄a bab -r -> ˇ鞄a bab -ra 惼heir friends [HL] [HL] [HL] ˇc偬 ˇb鞄i -> ˇc偬 ˇb鞄i 偬er pet [HL] [HL] [HL] ˇc偬 wih -bo -> ˇc偬 wih -bo ˀher tray' [HL] [HL] [HL] ji ˇk鵝 -> ji ˇk鵝y shaman [HL] [H] ji bab -r -> ji bab -r 惵y friends [H] [HL] [H] ji ˇb鞄i -> ji ˇb鞄 惵y pet [H] [HL] [H] ji wih -bo -> ji wih -b ˀmy tray' [H] [HL] [H] For example in ˇb醆 ˇb鞄 壺ur pet the [HL] accent of ˇb鞄i 偬et is replaced by [H] (cf. ˇc偬 ˇb鞄i 偬er pet) in apparent agreement with the [H] of the pronoun. Similarly, in ˇ鞄a ˇk鵝u 惼heir shaman , the [H] of ˇk鵝 has been replaced by the [HL] accent that characterizes ˇ鞄a (cf. ˇb醆 ˇk鵝 壺ur shaman). Unlike compounds and the post-accenting constructions in which the two constituents form a single word, the Barasana possessive construction comprises two accentual domains. If it were one accentual domain then we would expect just a single [HL]. Another argument for two domains comes from the preservation of left-edge extrametricality. The low pitch at the beginning of a pronoun is not copied into a following noun (cf. ji ˇb鞄 惵y pet). More importantly, the low pitch at the beginning of a noun such as bab -r 惱riends is not disturbed in the presence of a [HL] pronoun such as ˇ鞄a (cf. ˇ鞄a bab -ra惼heir friends). If the initial mora of these nouns is extrametrical and all pitch accents are assigned to metrically prominent positions then its failure to participate in the phenomenon is expected. One possible analysis of 挸ccent copy runs as follows. First, we propose rules of morphology that endow morphemes bearing [晀erson] features with the following exponence: [+person] = [H], [−person] = [HL]. Second, in a possessive construction specified by a pronoun the [晀erson] specification of the possessor is copied onto the noun in the morphology. Third, in the competition for insertion, exponents of grammatical features take precedence over exponents of lexical features.5 According to this analysis the accent replacement operation seen in (24) actually takes place in the morphology at the point where grammatical features are endowed with phonological exponence. It is thus a type of construct state marking. This view is supported by the fact that the accent substitution in the possessive must take place before the rules of accent resolution outlined in section 4.3. In particular, as we have seen, a [HL] root suppresses the [HL] of a following suffix: cf. /HLbidi+HLçöa/ 惾e-dimin. b醆 ˇb鞄 -çöa 壺ur pet-dimin. from /HLbadi HLbidi+HLaka/ from /HLbadi HLbidi+HLaka/. Thus, when such a word is modified by a first or second person possessor, its root shifts to [H] and the tone of the diminutive suffix resurfaces: ˇb醆 ˇb鞄 -çöa 壺ur pet-dimin. from /Hbadi Hbidi+HLaka/ from /Hbadi HLbidi+HLaka/. Thus, a word-internal property of the stem+suffix resolution depends upon the location of the word in a larger syntactic context. This is quite unusual as a phonological computation, which normally takes place from the inside out. But it makes sense if the phenomenon of 挸ccent copy reflects a morphological agreement process that precedes the phonology.6 To sum up this section, we have reviewed accent changes in three Barasana constructions of the form [X+Y] in which the tonal melody of Y is replaced. In compounds and specifiers, X and Y belong to a single accentual domain while in the possessive they belong to separate domains. In compounds the pitch accent of X predominates in virtue of the compound accent rule. In the specifiers, a boundary accent (realized as a [HL] pitch accent) is assigned via the right-facing metrical bracket that dangles from the edge of the specifier. Finally, in the possessive the pitch of the stem replicates the pitch of the pronoun (through agreement). 6. Verbal Accent 6.1. Four Basic Categories. In Barasana verbs inflect for a distinction between interrogative vs. declarative mood as well as person agreement with the subject. Our discussion of the verbal accent utilizes the four canonical verb roots in (26), one from each of the four basic patterns. (26) H c - 惵eut HL b 醢 - 惶wim H ba - 惡at HL cu - 偬eave The first inflectional category combines [+declarative, −person]—i.e. third person subjects in the declarative mood. In this category the subject (which normally follows the verb in this OVS language) is marked by an agreement suffix in the verb. There are two series of subject and aspect marking suffixes, illustrated in (27). We will see in 6.4 that the (b) series introduces a [HL] accent. (27) a. [+completed]: ˉbi 惷e b. [晀completed]: ˉbi ˇbo 惶he swam' b醢-be惷e ˇba 惶he did not swim' ba ˇba 惼hey weaved' cu -be惖a 惼hey did not weave' Consider now the data in (29), which illustrate the verb in the third person interrogative [−declarative, −person]. After the negative, the interrogative suffix -ri takes the variant -ti by regular processes. (29) c鵝a-ri ˇ釤 偬idid he cut? c鵝a-be-ti ˇ釤 偬idid挾a he cut? b醆a-ri ˇc偬偬 偬idid he swim? b醆a-be-ti ˇc偬偬 偬idid挾a he swim? ba -ri ˇ釤 偬idid he eat? ba -be-ti ˇ釤 偬idid挾a he eat? cu -ri ˇ鞄a 偬idid they weave? cu -be-ti ˇ鞄a 偬idid挾a they weave? Two differences from (28) are to be noted. First, there is no longer a suffix marking the subject. Second, there is a tonal change in the root, which now has a uniform [HL] shape (modulo extrametricality). Given our analysis of the possessive construction in 5.3, this paradigm might suggest that the pitch accent of the verbal root has been replaced with the [HL] exponent of third person subjects. But if this is the correct analysis then it is unclear why such accent replacement does not also happen in the declarative form (28). In fact, when we consider the corresponding first and second person forms, it becomes clear that accent replacement is not the best analysis. The first case (30a) is [+declarative, +person] and the second (30b) is [−declarative, +person]. In the former the suffix -bi takes the alternant -hi after the negative by regular rules. (30) a. c -b 惼you/we cut c -b -hi 惼you/we did not cut b後-b 惶wim ba -b 惷at ba -b -h 惷at cu -b 偬eave cu -b -hi 偬eave b. c -b 偬idid I/you/we cut? c -t 偬idid挾a I/you/we cut? b後-r 惶wim b後-b -ti 惶wim ba -r 惷at ba -b -t 惷at cu -r 偬eave cu -b -ti 偬eave In these paradigms the root accent is replaced by a [H], which indeed does mark the first and second person. But there is one systematic difference from the possessive construction. If the verb root belongs to the [HL] class then there is always a fall in tone after the root: b後-b -hi, cu -b -hi, b後-b -ti, cu -b -ti. Compare this with the possessive construction: when the [HL] melody of the stem is replaced by [H], either there is no subsequent fall (ˇk鵝a-coti 惶oup pot but ˇb醆 ˇk鵝 -c鞱e 壺ur soup pot instead of *ˇb醆 ˇk鵝 -c鞱i) or if there is a fall then it derives from

[HL] of a suffix such as the diminutive (e.g. h麟a-o-bi -aka 憎anioc press-dimin. but ˉb麟 ˉh麟a -b -a 憎ur manioc press-dimin.). To summarize then, two generalizations emerge from the paradigms of (29) and (30). First, there is subject agreement reflected in a [HL] vs [H] pitch realized on the stem. Second, the role of the root is realized on the suffixal inflection in the bold forms of (31). 6.2. Accent Shift (D閃alage). Following Gomez-Imbert (1997a), our analysis of this alternation posits a tonal prefix for (29) and (30) that marks subject agreement: [HL] for third person ([-person]) and [H] for first and second person ([+person]). These are, of course, the expected phonological exponents for the [±erson] distinction, given the tonal properties of the pronouns (23). The tonal prefixes appear on the verb except in the declarative third person forms where subject agreement is marked by a segmental suffix. The Barasana inflected verb in the completed aspect thus has the morphological structure in (31).7 (31) [+declarative, -person] verb + ˉbi, ˉbo, ˉba, bi [-declarative, -person] [HL] + verb + ri [+declarative, +person] [H] + verb + bi [-declarative, +person] [H] + verb + ri If the [H] and [HL] pitch accents are realized via association to metrically prominent moras, the basic premise of our analysis, then the otherwise peculiar tonal changes in (29) and (30) begin to make sense. Since the subject prefixes lack any segmental exponence their pitch accents can only be realized by mapping to the prominence of the verbal root. But plausibly this will lead to a displacement of the root扟 inherent pitch accent which shifts to the next available prominence on the following morpheme. In (32) we show the postulated input-output mappings for the canonical verbs c - 慶ut [H] and b麟- 憩wim [HL] under this proposal. (32) a. [-person, +declarative] [cua+bet+ˉbo] -> cua-be-ˉbo > c -b -ˉb | [H] [HL] [baa+bet+ˉbo] -> baa-be-ˉbo -> b麟-be-ˉbo | [HL] [HL] b. [-person, -declarative] [cua+bet+ri] -> cua-be-ti -> c 鶏-be-ti | | [HL] [HL][H] [baa+bet+ri] baa-be-ti -> b麟-be-ti | | [HL] [HL][HL] c. [+person, +declarative] [cua+bet+bi] -> cua-be-hi -> c -b -h | | [H] [H] [H] [baa+bet+bi] baa-be-hi -> b後-b -hi | | [H] [H] [H] d. [+person, -declarative] [cua+bet+ri] -> cua-be-ti -> c -b -t | | [H] [H] [H] [baa+bet+ri] -> baa-be-ti -> b後-b -ti | | [H] [H] [H] Below in (33) we show the crucial part of the derivation for b後-b -ti. In the first step rule (8v), which was generalized to the word-level in 5.2 to account for the boundary accent in specifier constructions, associates the prefixal [H] pitch accent to the closest metrical prominence桿he one on the following verbal root. The resultant doubly accented mora then simplifies by delinking the [HL] pitch accent of the root, which then associates to the next available metrical prominence by reapplication of (8v). (33) L1 * * L0 (* * (* * baa-be-ti input to word level | | [HL] [HL] L1 * * L0 (* * (* * baa-be-ti associate tones / \ |[HL] L1 * * L0 (* * (* * baa-be-ti delink and reassociate | | [HL] The word level rules developed in 4.2 then project the displaced [HL] as the prominence for the entire word. The suffixal vs. prefixal realization of the subject agreement in the verb postulated in (31) finds an exact parallel in Tatuyo (Gomez-Imbert 1982). In [+declarative, -person] Tatuyo verbs the subject is marked by a suffix (34a) while in the other three categories it is marked segmentally by a prefix, with HL tones for [-person] (34b) and L tone for [+person] (34c,d). Because the HL prefixes are monomoraic, the L tone floats and produces a downstep (!). Barasana has evidently evolved from this state through erosion of the segmental exponence of its prefixes leaving just a HL vs. H residue. Tatuyo verbs have three lexically determined tonal melodies: H, HL and LH. (34) a. [+declarative, -person] hu -ˉw 感e cut hu -ˉke-ˉbi 感e did not cut b麟-ˉwo 憩he swam b麟a-ˉke-ˉbo 憩he did not swim ig -ˉw 憿hey ate ig -ˉke-ˉba 憿hey did not eat ig -ˉr 憩the weaved h -ˉw 憩he swam? b. [-declarative, -person] k !-hu -ˉr 憩id he cut? k !-hu-ˉke-ti 憩idn挾he cut? k !-b麟-ri 憩id she swim? k !-b麟-ˉke-ti 憩idn挾she swim? d. !-ig -ˉr 憩id they eat? d !-ig-ˉke-ti 憩idn挾they eat? k !-h -ˉr 憩id she weave? k !-h -ˉke-ti 憩idn挾she weave? c. [+declarative, +person] ji-hu -w 憬ut ji-hu-ˉke-pi 憬didn挾swum ˉbi-b麟-wi 憬ou swam ˉbi-b麟-ˉke-pi 憬ou didn挾swim ha-ig -w 憬excl. ate ha-ig-ˉke-pi 憬e didn挾eat ˉbadi-h -w 憬incl. weaved ˉbadi-h -ˉke-pi 憬e didn挾weave d. [-declarative, +person] ˉbi-hu -r 憩id you cut? ji-hu -ˉke-ti 憩idn挾you I cut? ˉbi-b麟-ri 憩id you swim? ˉbi-b麟-ˉke-ti 憩idn挾you swim? ha-ig -r 憩id we eat? ha-ig -ˉke-ti 憩idn挾we eat? ˉbadi-h -r 憩id we weave? ˉbadi-h -ˉke-ti 憩idn挾we weave? The d閃alage also strengthens our decision to treat the left-edge low pitch as extrametrical. The extrametrical mora remains invisible to the association of both the [H] and [HL] person prefixes, as shown by the paradigms for H ba - 憊at and HL cu -憊leave in (30) above. In (35) we cite a few more paradigms that illustrate the displacement of the root扟 [HL] in the presence of a [+person] prefix. These are constructed from compound verbs—a very productive process in verbs too. In the final entry in each paradigm the [HL] pitch accent of the first root has been displaced to the second by the [+person] prefix. (35) a. ˉk勝-ˉbo 憩he measured ˉi -ˉbo 憩he saw ˉk勝-ˉia-ˉbo 憩he verified ˉi穣-ˉ穬-bi 憶you/we verified b. ˉked勝-ˉbo 憩he made ˉk鷄-ˉbo 憩he placed in order ˉked穣-ˉk鷄-bo 憶you/we placed in order c. id -ˉbi 感e drank rot -ˉb 感e commanded id -roti-ˉbi 感e offered to drink id r麟bi-bi 憶you/we offered to drink d. cu -ˉbo 憩he weaved hu -ˉb 憩he sat cu -huja-ˉbo 憩he sat weaving cu -h鷄a-bi 憶you/we sat weaving Independent evidence exists from the d閃alage process that the [HL] shifted accent seeks out a metrical prominence for its realization, as illustrated in (36) by trimoraic verbal roots. (36) a. ˉb替aa-ˉbo 憩he painted the face red ˉb替é後-b 憶you/we painted the face red ˉb替é後-ˉb麟ti-bi 憶you/we painted the face red yesterday (—ˉbaci- prehordernial) b. h鶏a-ˉbi 感e fell over h鶏磯碑-b 憶you/we fell over h鶏磯碑-b麟ti-bi 憶you/we fell over yesterday h鶏磯碑-b -hi 憶you/we didn挾fall over When they are [H] and combine with a [H] [+person] prefix, the three moras of the stem could accommodate the [H] tone prefix as well as the [HL] of the root. But in fact the [H] of the root moves further to the right seeking out the next metrical prominence in the suffixal inflection. Thus, we find ˉb替é後-ˉb麟ti-bi (37a) instead of *ˉb替é碑-ˉbaci-bi (37b). (37) a. babaa-ˉbaci-bi b. *b替é碑-ˉbaci-bi | | | | [HL] | [HL] [HL][HL]. c. *di-roti-bi -> di-roti-bi -> di-roti-bi | / | | | [H] [HL] [H][HL] [HL] Furthermore, evidence exists that (37a) cannot be derived from (37b) by another tone shift in order to avoid two successive H扟 (the Obligatory Contour Principle OCP). If the OCP were at play here then we would expect *id -rot -bi instead of the correct id -r麟bi-bi 憶you/we offered to drink . To clarify this point, consider the derivation in (37c). We assume the derivation starts with H[HLdi+roti+bi]. In the first step the floating prefixal [H] docks in the root displacing the [HL] which tries to map to the first mora of roti. But the OCP would block this outcome and so the [H] should be displaced one mora further to the right to give *id -rot -bi. But this is incorrect so we conclude that the OCP plays no role in the d閃alage. 6.3. Stabilizer Prefix. Barasana verbs inflect for a contrast analogous to the stage-level vs. individual-level distinction (Kratzer 1995). The former marks a temporary state of affairs while the latter indicates an ongoing, stable state. Gomez-Imbert (1997a) refers to the latter as 撹tabilis関. Consider the tonal minimal pairs exhibited by the four canonical roots in (38a vs 38b). The words, built from a root and a classifier suffix (-gi/ki for masculine and go-/ko- for feminine), are segmentally identical. In (38a) they enter into the progressive construction as gerunds with the auxiliary verb j - 憗o (realized as j - before the incomplete suffix -a-). These forms are stage-level. In (38b) they are agentive nominalizations followed by the verb -j ( )- 憎e . These forms are individual-level. Close scrutiny of the individual-level (38b) paradigms reveals the following generalizations. First, the [H] verbs c - 慶ut and ba - 憊at have their root tone replaced by [HL]. Second, the [HL] verbs b麟- 憩wim and cu - 憊leave shift the root tone to the suffix (realized as a fall in the negative: b麟-b -ko and cu -b -ki). The d閃alage is a tip-off that the stable aspect is marked by a tonal prefix. (38) a. b. c - 慶ut [H] [c -g j -a--bi [H c鶏a-gi-j - --bi Hstab [H 感e is cutting 感e is a cutter c -b -k j -a--bi[c鶏a-be-ki -j - --bi 感e is non-cutting 感e is a non cutter b麟- 憩wim [HL] b麟a-go j -a--bo [HL b後a-j -j - --bo Hstab [HL b後a-b -ko -j - --bo 憩he is non-swimming 憩he is a non-swimmer ba - 憊at [H] ba -g j -a--bo [H ba -go-j - --bo HLstab [H 憩she is eating憩 憩he is an eater ba -b -k j -a--bo ba -be-ko -j - --bo 感e is non-eating 憩he is a non-eater cu - 憊leave [HL] cu -gi j -a--bi [HL cu -g -j - --bi Hstab [HL 感e is weaving 感e is a weaver cu-be-ki j -a--bi cu -b -ki -j - --bi 感e is non-weaving 感e is a non-weaver But then there is a disparity in the shape of the stabilizer prefix. Before the [HL] roots b麟- 憩wim and cu - 憊leave it acts as if it has a [H] shape while before [H] roots c - 慶ut and ba - 憊at it acts as if it has the [HL] shape. Rather than posit a special rule to account for this alternation (cf. Gomez-Imbert 1997a) we suggest here that the stabilizer morpheme is 撹olar in nature: it takes a tone that belongs to the inverse category of the root tone. It is thus [HL] before a [H] root and [H] before a [HL] root. Once again, the low pitched extrametrical mora does not figure into this calculation. If the [HL] pitch accent is treated as a unit (as we have been implicitly assuming), then the alternation displayed by the stabilizer prefix falls under the Obligatory Contour Principle of Leben (1973) which eschews adjacent identical tones.8 (39) stab root o o / \ / \ H L H L tonal root node stab root o o / | H H tonal root node The stabilizer prefix can also appear in inflected verbs. However, when it is introduced into verbs that inflect for a subject marking prefix we find that the tone of the subject prefix neither surfaces nor displaces the tone of the base. This point is demonstrated by the paradigm in (40a) with the suffix 初a(t)- which introduces the stabilizing modal together with the polar prefix. In Tatuyo, the stabilizer is a segmental prefix with H tone , which appears between the person prefixes and the base. (40) a. b. c鶏a-ka-ti -蘇 憩id he in fact cut? c鶏a-be-ti -蘇 憩idn挾he cut? c鶏a-ka-ti -bi 憩id you in fact cut? c -b -t -bi 憩idn挾you cut? b後a-k -ti -bi 憩id he in fact swim? b麟a-be-ti -蘇 憩idn挾he swim? b後-k -ti -bi 憩id you in fact swim? b後-b -ti -bi 憩idn挾you swim? As shown in (40a), changing the [±erson] specification has no effect on the tone of the verb. Compare the verbs in (40b) without the stabilizer prefix. Here the tone of the verb alternates as the subject of the verb is changed from [-person] to [+person]. For example, given the [H]+[H] specification for the [stab+verb] b麟- 憩wim , we might have expected the addition of a [H] third person prefix to wipe out any tonal specifications on the suffixes. But as b後-k -ti shows, this is not what happens. Rather when a normally inflected verb is combined with the stabilizer, the accent 槭reezes . If we make the crosslinguistically motivated assumption that modal marking appears inside subject agreement then these verbs have the structure [agr+mod+root...]. In the competition for association to the metrical prominence of the root, the modal prefix has a built-in advantage because it is closer and hence beats out the subject marking. Once again, this analysis for Barasana is supported by Tatuyo where the stabilizer prefix appears closer to the root. In (41) we cite a paradigm that combines the stabilizer with the negative (appearing in its bimoraic allomorph). The [HL] roots b麟- 憩wim and cu - 憊leave shift their pitch accent to the negative suffix. (41) c鶏a-beti-ka-ti 憩id he in fact not cut? HL HLstab [H b後-b閃-ka-ti 憩wim HL Hstab [HL ba -beti-ka-ti 憊at HL HLstab [H cu -b閃-ka-ti 憊leave HL Hstab [HL 6.4. Tonal Suffixes. Earlier (27) we introduced two series of personal suffixes. In (28) we illustrated the [+declarative, -person] verbal category in the completed aspect with the (27a) series of subject suffixes: -ba, --bi, --bo, -bi. We will now show two verbs with the (27b) series which is unmarked for completedness [咮omplete]: --ba, --bi, --bo, -ha. In the slot between this series of suffixes and the verb stem various aspectual and modal affixes can occur in Barasana: -a- 槭ncomplete, witnessed , -ro- 憂on-visible , -ju- 槭nferred . These categories are all associated with a fall in tone at this suffix. Of course, this fall surfaces only if the preceding verb stem belongs to the [H] class; a preceding [HL] overshadows the suffix. Our analysis postulates a [HL] suffix for this [咮omplete] series along with a rule that accents suffixes in this slot (42d) by wrapping their line-0 grid mark in a right-facing bracket. (42) a. c -j --bi 憬e might cut HL b 麟-ju--bi 感e might swim [HL] HL ba -j --bi 感e might eat [H] HL cu -ju--bi 感e might weave [HL] HL b. c鶏a-be-a-ti 憬oes he not cut? HL [H] HL b麟-be-a-ti 憩wim HL [HL] HL ba -be-a-ti 憊at HL [H] HL cu -be-a-ti 憊leave HL [HL] HL c. c -b - -ti 憬o you not cut? H [[H] HL b後-b -a-ti 憩wim H [HL] HL ba -b - -ti 憊at H [H] HL cu -b -a-ti 憊leave H [HL] HL d. -> (/ _ * | [咮omplete] In the [-person, +declarative] verbs of (42a) the [HL] of b麟- 憩wim and cu - 憊leave prevail over the [H] suffix. But the suffixal [HL] surfaces when appended to the [H] roots c - 慶ut and ba - 憊at . In (42b) the verb is [-person, -declarative] and hence has the [HL] prefix marking third person. Being leftmost in the word, this accent prevails over the others, including the [HL] suffix. For the verbs of (41c) the prefix is [H]; hence the [HL] suffixal accent surfaces on the [H] roots c - 慶ut and ba - 憊at ; but the shifted [HL] of b麟- 憩wim and cu - 憊leave overshadows the suffix. As shown by the data in (43), the imperative, which lacks subject marking, also exhibits the [HL] suffixal accent. But instead of appearing on the suffix -ja it is retracted one syllable by a special rule that avoids a word-final accent, perhaps in search of a bimoraic foot. The retraction also allows both components of the [HL] pitch accent to surface phonetically. (43) c -ja 慶ut! c -b -ca 憬on挾 cut! [H] HL b麟-ja 憩wim! b麟-be-ca 憬on挾 swim! [HL] HL ba -ja 憊at! ba -b -ca 憬on挾 eat! [H] HL cu -ja 憊leave! cu -be-ca 憬on挾 weave! [HL] HL c -ja 慶ut! and b -ja 憩wim show the expected tones: the first has suffixal [HL] while the second has root [HL]. But the extrametrical /a[H]/+ja[HL]/ 憊at and /a[HL]/+ja[HL]/ 憊leave have just a single nonfinal metrical position and hence the [HL] is ambiguous between root vs. suffixal accent. The corresponding negative forms suggest that ba -ja has suffixal accent and cu -ja has root accent. 7. Accentual Domains. In the data we have seen until this point, there is just a single pitch rise per word. However, when the word becomes long enough it splits into separate domains in Barasana桾ach marked with a separate peak and the potential for left-edge extrametricality. Let us examine the paradigms in (44) to make this point. (44) a. ba -r麟e --ba -r麟e #-bac -b 感e offered to eat 感e offered to eat yesterday b. -ked勝-kuu#-j --b -ked勝-kuu#-j後--b醯 --b 憩he was occupied placing in order 憩he was occupied placing in order yesterday c. ~ked襖-k鷄#-j -b ji -ked襖-k鷄#-j後--b醯 -b ji 憎 was occupied placing in order 憎 was occupied placing in order yesterday d. -jag --hedi#huj --b -jag --hedi#huj --b 憩he chatted while sitting 憩he chatted while sitting yesterday cf. huj --b 憩he sat , -jag --b麟o --b 憩he talked while sitting In (44a) we see the verbs ba - 憊at [H] and rot -憅order [H] combined into a compound. When the inflectional suffix --bi is added, the [H] of ba - spreads to all following syllables. But when the bimoraic prehodiernal suffix is inserted into this verb, we suddenly find a pitch drop on the first mora of the prehodiernal --bac followed by another peak which extends over the final suffix. In (44b) three roots comprise the stem: ~ked勝- 憬ake , ˉk鷄- 憅lace [HL], and -j ( )- 憎e [H]. In the declarative mood the verb forms two domains (separated by the # symbol). Insertion of the prehodiernal suffix does not increase the number of domains; but it does force -j ( )- 憎e to augment (see Gomez-Imbert 1997b for a discussion of augmentation). Example (44c) shows that the effect of the person prefixes on the stem is restricted to the initial domain. The next example (44d) illustrates extrametricality of the verb huj - 憩it [H] surfacing at the left edge of the second accentual domain. We may account for these data if Feet (line-1 constituents) are organized into a higher level of prosodic structure we shall call the Accentual Domain (AD). Binary seems to play a role at this level of structure preventing the AD from taking three feet as daughters. Thus, ba(-(r麟e --b has two feet while ba(-(r麟e -(~bac -b would have three (recall that extrametricality is only found at the left edge of the word of accentual domain). The alternative parse ba(-(r麟e #-ba(c --b with two accentual domains is assigned instead. The other forms of (44) work comparably. Although much more can be said about the structure of Accentual Domains in Barasana (see Gomez-Imbert 1997a for discussion), we shall bring our discussion of Barasana accent to a close with a puzzle. Examine the data below (45). These verbs are of the same structure as (44c,d) but differ in that there is a fall in tone after the negative be-. (45) a. -ked勝--kuu#-t穣 --b -ked勝--kuu#-t穬 --b醯 憩he placed in order fast 憩he didn挾 place in order fast cf. ~t穣a--b醯 憩he did fast b. -j -h鶏a #-rig穣--b -j -h鶏a #-rig襖-b --b醯 憩he aimed and blew while- 憩he did not aim and blow while holding straight holding straight (the blowpipe) cf. ~rig勝-be--bo 憩he didn挾 hold on The difference is systematic and correlates with the fact that the verbs -t穣a- 憅urry and -rig穣- 憅old straight beginning the second accentual domains in (45) are drawn from the [HL] accent class while -j ( )- 憎e and huj - 憩it in (44c,d) are drawn from the [H] class. In other words, [HL] verbs beginning the second domain shift their accent to the right. Given our overall analysis of Barasana, the simplest explanation for this accent shift is to posit a floating [H] tone at the left edge of the second accentual domain. What could be the source of this [H]? A plausible guess is that it is a boundary tone, perhaps the grammaticalization of a 撹ontinuation rise pitch accent. What is remarkable about Barasana is that floating [H]桻t dock to the stem on their right setting off the d閃alage of the [HL] accent discussed in 6.2.9 8. Typology. Barasana has many of the properties of a classic pitch accent system such as Japanese. Pitch accent systems themselves, of course, are a hybrid in the traditional typology standing between 撹tress languages like English on the one hand and 揑onal languages like Mandarin Chinese or Yoruba, on the other. It is an open question whether such classifications of the entire grammar make much sense in the light of the developments in autosegmental-metrical phonology. After all, a stress language like English has intonation contours that have been successfully analyzed as tonal melodies (see Ladd 1996 for a useful review); and recent research has shown that Chinese tone is responsive to metrical structure (e.g. Duanmu 1995). But granted this point, it might still be useful to situate Barasana in the traditional typology. We do this by comparing its various features to Japanese桾he paradigm exemplar of a pitch accent language. The following points seem worthy of mention. First, in both languages prominence is marked phonetically by an Fo pitch change rather than by duration or amplitude. Second, a particular mora of the word is singled out as psychologically salient桿he locus of accent. In Tokyo Japanese, it is the point of pitch drop, i.e. the mora where a [HL] pitch accent is assigned in the analysis of Pierrehumbert & Beckman (1988). The locus of pitch drop is equated with stress in loanword adaptation from English (see Shinohara 2000 for recent discussion). Barasana behaves similarly with respect to Spanish and Portuguese loanwords: /pac樓 u/ Francisco, /bar縺/ Mar縺, /par縺u/ port. palito憖atch . Third, the contrastive status of accent varies from one Japanese dialect to another as well as within different lexical classes. In the Tokyo dialect it is contrastive in nouns while in accented verbs the prominence falls on the syllable containing the penultimate mora. While the Tokyo dialect has just a single [HL] tonal melody, in the Osaka dialect stems contrast for [HL] vs. [LHL] (Haraguchi 1988). Like Osaka, Barasana contrasts tonal melodies ([HL] vs. [LHL] but the location of accent is largely predictable (given lexically contrastive 揑nvisibility of the first mora of the word). Fourth, both Japanese and Barasana are characterized by culminativity. If the input has multiple accents then one is projected as the word accent: the leftmost one in both systems. In Cupe縺 (Alderete to appear based on Hill & Hill 1968) it is the rightmost pitch accent that is projected as the word accent. In addition every word carries a pitch peak and hence a prominence in Barasana, while Tokyo Japanese and Basque have a class of unaccented words that acquires its Fo contour from the phrasal phonology. 9. Alternative Analysis. The distinctive feature of our analysis is its reliance on both tones (represented as [H] and [HL] pitch accents) as well as the metrical grid. The basic intuition is that tones are realized through the metrical prominences of the grid analogous to the way in which pitch accents are attracted to metrical prominences in the analysis of intonation contours in many languages. In this section we consider alternative analyses of the Barasana Fo contours that either dispense with the grid or with the tonal pitch accents. 9.1. A 撹one-Only Analysis On this analysis morphemes are marked in the lexicon for H and HL tonal melodies (comparable to [咮asal] autosegments). The melodies are realized by cyclic left-to-right mapping to the individual morphemes (with extratonality at the left edge of the domain) and rightward tone spread to the toneless

suffixes. The fact that there is just one HL fall per word may be treated by invoking a total downstep . As mentioned in (4.2), in many tonal systems the second H of a HLH sequence is realized at a lower Fo value than the first H. Total downstep phonologizes this phonetic phenomenon via the rule: HLH -> HLL. The following derivations of the canonical words from (11) illustrate this approach. (46) /-kubu + aka/ /-bidi + aka/ /gohe + re/ underlying rep. H HL HL HL H -------------- -------------- he + re extratonality H -kubu + aka -bidi + aka he + re L-R association | | | | | | | | H HL HL HL H -kubu + aka -bidi + aka he + re tone spread | / | | | | | | / | / H HL HL HL H While a purely tonal analysis can be made to work plausibly for the basic system, it does not elucidate the accentual alternations that we have considered in sections 5 and 6. Most problematic is the dʒalage alternation in the verb. As we saw in 6.2, when the verb root is trimoraic the docking of a floating H will displace the root's inherent tonal melody just one mora to the right (47). (47) ~babaa +~baci + bi -> ~babaa + ~baci + bi -> ~babaa + ~baci + bi | | / | | H H L H H L H H L But in fact the root tone is systematically shifted to the first mora of the following morpheme metrically prominent on our analysis: H+ [HL-babaa+~baci+bi] -> [H-babaa+HL-baci+bi]. This extra displacement is unexpected under the purely tonal analysis and as argued in 6.2 cannot be explained away by the OCP. 9.2. A ꞉rid-Only Analysis. Morris Halle (personal communication) has suggested an alternative ꞉rid only approach to the Barasana accents that relies crucially on the single bracket formalism of Idsardi (1992) and Halle & Idsardi (1995). We sketch this alternative here and briefly compare it with the analysis we have offered. The rules comprising the core of the analysis are given in (48). The key idea is that metrical grids with left and right facing brackets determine a metrical prominence for the word; the bracketings are the sites for insertion of H and L tones which then spread in familiar autosegmental fashion to form idealized Fo contours. On this view the tones are not properties of individual morphemes but rather arise in the course of the derivation. See Purnell (1997) and Kim (1999) for analyses of various Japanese pitch accent systems in these terms. Halle's other suggestion is that the four accent classes of Barasana morphemes be represented in the lexicon by two diacritic features [꞉] and [꞉]. These features guide the application of various Edge-Marking rules that metrify line-0 of the grid. The first categorizes morphemes in terms of whether they eventuate in a H vs. HL pitch contour. The second classifies them in terms of whether or not they undergo a rule that suppresses the grid mark at the left edge of the word. The metrification of line-0 is completed by setting the head parameter to Left. Line-1 is metrified by the familiar LLL Edge-Marking rule with heads again set to Left. Finally there are three simple tone rules. The first inserts a high tone on the most prominent mora of the word; the leftmost one. The second inserts a low tone on the mora that follows the right bracket of line-0 inserted by rule (48-iii). This low tone is a barrier to the final tonal rule that spreads the high tone rightwards. (48) Line-0 i. * -> / # ___ line 0 [+B] ii. -> (/ + _ * line 0 (E-M: LLL) | [+A] iii. ->) / + * ___ line-0 (E-M: RRL) | [-A] iv. head = Left Line-1 v. -> (/ # ___ * line-1 (E-M: LLL) vi. head = Left line vii. Assign a high tone to the mora associated with a line-2 asterisk viii. Assign a low tone to the mora following the) bracket on line-0 ix. Spread H rightwards The examples below illustrate how the analysis derives the three canonical Barasana words of (11). (49) /-kubu + aka/ /-bidi + aka/ /gohe + re/ underlying rep. +A,-B -A,-B -A,-B +A,+B L0 * * * * * * * ~kubu + aka -bidi + aka gohe + re projection +A,-B -A,-B -A,-B -A,-B +A,+B L0 . * * inapplicable inapplicable gohe + re 48-i +A,+B L0 (* * * . (* * -kubu + aka inapplicable gohe + re 48-ii +A,-B -A,-B +A,+B L0 (* * *) * *) * *) * *) ~kubu + aka -bidi + aka inapplicable 48-iii +A,-B -A,-B -A,-B -A,-B +A,+B L1 * * * * L0 (* * *) * *) * *) . (* * -kubu + aka -bidi + aka gohe + re 48-iv +A,-B -A,-B -A,-B -A,-B +A,+B L2 * * * L1 (* (* * (* L0 (* * *) * *) * *) . (* * -kubu + aka -bidi + aka gohe + re 48-v, vi L2 * * * L1 (* (* * (* L0 (* * *) * *) * *) . (* * -kubu + aka -bidi + aka gohe + re 48-vii, viii | | | | | | / H L HL L H -kubu + aka -bidi + aka gohe + re 48-ix | / / | | | | / / H L HL L H The chief features distinguishing the grid-only analysis from the mixed system we have proposed are as follows. First, in the tone+grid analysis morphemes are distinguished in the lexicon in terms of [H] vs. [HL] pitch accents which are then aligned with tone-bearing units (moras) via the prominences of the metrical grid. In Halle's suggested alternative the lexical representations are distinguished at two degrees of abstractness above the tonal features that form the core of the Fo contour. Morphemes are first distinguished in the lexicon in terms of the diacritic feature [꞉]. This feature then activates the rules that construct the metrical grid. The brackets of the metrical grid in turn serves as the reference point for the insertion of tones. Second, the analyses differ in terms of the location of metrical prominence for words with a HL contour. According to the analysis of 4.2 the metrically prominent position is the site of the HL pitch drop while in the alternative of (48) it is always the leftmost mora of the word. Finally, since tones are derivative from metrical structure in the ꞉rid-only analysis, the alternations arising from the segmental erosion of the Barasana prefixes cannot be treated in terms of floating autosegments. Rather Halle's suggestion is that Barasana has reinterpreted these alternations (as well as the others reviewed in sections 5 - 7) as the product of rules that change the [꞉] feature structure of individual morphemes depending on the morphological context. Let us consider these rules one by one. In compound structures the [꞉] specification of the second member is nullified: recall /~꞊ +~꞊/ -> ~꞊ --꞊ 憉irl sp. In particular, rule (48iii) that inserts a right bracket must be blocked. While we could simply delete the [A] (and [B]) specifications of the second element, the rule in (50) makes the minimal adjustment required. Stem / \ Root Root | | (50) [-A] -> [+A] / [X] [__] The determiners of 5.2 induce a pitch drop on the first mora of the following noun: wec 憉anioc garden , di -w閨e 憉hich garden? . We can achieve this effect by the rule in (51) that changes the noun to [-A] (a right bracket insertion site). DP / \ Det Noun | | (51) [+A] -> [-A] / [X] [__] For the ꞊opy phenomenon of 5.3, the [꞊] value of the noun root is changed to agree with the value of the preceding pronoun by the familiar greek letter variable notation. DP / \ Pronoun Noun | / (52) [ ] -> [a꞊] / [a꞊] [__] The d꞊alage alternation was treated in 6.2 as the docking of a prefixal pitch accent to the first mora of the verb which then triggers the reassociation of the stem's inherent pitch accent to the next available docking site the initial mora of the following morpheme. In the alternative diacritic analysis two rules are proposed. The first copies the [a꞊] specification of the verbal root onto the post-root morpheme in the first and second person as well as in the third person interrogative. We will assume here that these contexts can be identified as those in which the [꞉erson] feature is prefixed in the morphosyntactic representation. This process is followed by rules (53ii,iii) that change the verbal root to [-A] in [-person] forms and to [+A] in [+person] forms.10 (53) i. [ ] -> [a꞊] / [person] [a꞊] + [__] ii. [ ] -> [-A] / [-person] + [___] iii. [ ] -> [+A] /[+person] + [__] The canonical verbs /cua-/ cut and /baa-/ swim ([H] and [HL], respectively, in the mixed analysis) are derived as follows (54). First, the inherent [꞊] of the root is copied onto the negative morpheme. Then the roots are changed to [-A] in the [-person] third person forms and to [+A] in the [+person] first and second person forms. Recall that [-A] morphemes activate the rule inserting a right bracket (the morpheme-level RRL Edge-Marking rule). This is the site for the low tone that blocks the spread of the H associated to the first mora and hence produces the drop in pitch. (54) c鸡a-be-ti 憉idn't he cut? c -b -t 憉idn't you cut? [-person][cua]-[bet]+[ri] [+person]+[cua]+[bet]+[ri] underlying rep. +A +A [-person][cua]+[bet]+[ri] [+person]+[cua]+[bet]+[ri] +A +A +A 53-i [-person][cua]+[bet]+[ri] inapplicable -A +A 53-ii c(u)a + b(et +ri c(ua + b(et+ri tonal rules | | | H L H b鸡a-be-ti 憉idn't he swim? b鸡a-b -ti 憉idn't you swim? [-person][baa]+[bet]+[ri] [+person]+[baa]+[bet]+[ri] underlying rep. -A -A [-person][baa]+[bet]+[ri] [+person]+[baa]+[bet]+[ri] 53-i -A -A -A -A inapplicable [+person]+[baa]+[bet]+[ri] 53-ii +A -A b (a)a + be)t + ri b(aa + be)t + ri tonal rules | | | | H L HL L Finally, to describe the tonal polarity of the stabilizer prefix a rule changing the verb root s inherent value for the feature [A] to its opposite can be postulated. Verb / \ stab root | / (55) [a꞊] -> [-a꞊] / [__] This exchange rule must apply after the copy rule of (53i). We assume that the stabilizer prefix occupies the slot between the subject marking prefix and the root. The rules (53) changing the root꞉l value for [A] as a function of the [꞉erson] value of the subject prefix fail to apply since the stabilizer intervenes and hence the [꞉erson] is not adjacent to the root. The following derivations ensue for c鸡on-be-ki 憉on-cutter masc. and b鸡a-b -ko 憉on-swimmer fem. from (38). (56) [-person][stab][cua]-[bet]+[go] [-person][stab] [baa]+[bet]+[go] +A -A [-person][stab][cua]+[bet]+[gi] [-person][stab][baa]+[bet]+[go] 53-i +A +A -A -A [-person][stab][cua]+[bet]+[gi] [-person][stab][baa]+[bet]+[go] 55 -A +A +A -A inapplicable inapplicable 53ii,iii c(u)a + b(et + gi b(aa + be)t + go | | | | H L H L It is remarkable that every conceivable transformation of the binary feature [꞊] is represented in the Barasana data: a change to [+A] (compound) or to [-A] (determiner), a change to the same value (construct state marking in the possessive, post-stem marking in the prefixed verbs) and a change to the opposite value (in the stabilizer aspect). The mixed tone+grid analysis produces these effects by recourse to various autosegmental and metrical mechanisms: enhancement of accent, post-accentuation, construct state marking, docking of floating tones. The two analyses differ ultimately on one basic point: whether Barasana accent is (still) primarily phonological in nature or rather has passed over into the realm of allomorphy. It is perhaps significant that there is no demonstrable allomorphy for the [꞊] feature which both analyses share in common. Also we are not aware of any other examples of such a rich and intricate set of context sensitive changes in allomorphy while the literature is replete with phonological systems of comparable or greater complexity. We hope that our discussion of the Barasana accents from these two quite different perspectives will stimulate a reconsideration of other cases along similar lines. 10. Summary and Conclusion. In this paper we have presented the major accent patterns of Barasana, based on the extensive description and analysis in Gomez-Imbert (1997a). Our major findings are first that the Fo profile of the word is simultaneously determined by autosegmental tonal as well as metrical accent principles, and second that accent is essentially a property of the morpheme in Barasana. Morphemes contrast for [H] vs. [HL] pitch accents as well as initial-mora extrametricality giving four accent classes. The pitch accents are realized via a covert metrical accent structure that enhances the left edge of the morpheme to give each morpheme a characteristic tonal profile. When morphemes are combined into words, one of the pitch accents is projected to become the nucleus of the word꞉l Fo contour. Accent projection as proceeds via a metrical construction that enhances [HL] accents over plain [H] and leftmost accents in case of a tie. Once the most prominent mora for the word is found, all other pitch accents are deleted and remaining moras assimilate the tones comprising the pitch accent of the metrical peak. We then examined several nominal constructions in which the accent of a noun is replaced when in construction with a preceding element (a compound, a specifier, or a pronominal) which either extends, projects, or replicates an accent on the second element of the construction. The next section of the paper examined the accentuation in the verb. Our major finding here is that Barasana has a series of tonal prefixes marking subject person agreement that associate to the stem, displacing the stem accent to the metrically prominent position in the following morpheme. The inflection of the verb also comprises tonal prefixes and suffixes marking various modal and aspectual distinctions. The final section of the paper examined cases where the word splits into two accentual domains in order to avoid triple branching structures. The juncture between domains is marked by a tone that sets off an accent shift reminiscent of one found in the verbal inflection. Critical topics for future research on Barasana accent include an instrumental study of the Fo implementation of the structures posited by our analysis both in isolation as well as in the phrasal phonology. FOOTNOTES * Portions of this paper were presented at the MIT Phonology Circle and University of New York (Stony Brook) Linguistics Colloquium. We thank the audiences for valuable comments. We also thank Stephen Hugh-Jones, Sam Rosenthal, and Cheryl Zoll. Finally, we wish to dedicate this paper to Morris Halle for the interest he has shown in us and our research into Barasana. Their language is called Jeb᷄baca ok or -had꞉l ok , ok meaning 憉anguage . The tilde preceding a morpheme indicates the morphemic property of nasality which we will introduce later. 2 For a description of linguistic exogamy see Jackson (1983), Gomez-Imbert (1991); for an ethnographic introduction to the Barasana society see C. Hugh-Jones (1979) and S. Hugh-Jones (1979). The Eastern Tukanoan groups traditionally engaged in linguistic exogamy are: Bara, Barasana, Desano, Eduuria/Taiwano, Karapana, Kubeo, Makuna, Piratapuyo, Pisamira, Siriano, Tanimuka, Retua-ra, Tatuyo, Tukano, Tuyuka, Wanano, Yuruti. The Tukanoan family is split into two branches, Eastern and Western, which have no contact presently. 3 See Gomez-Imbert (1997a, 1998). In this regard Barasana parallels Tuyuca (Barnes 1996) and Tukano (Ramirez 1997) where both nasality and accent or tone are properties of the entire morpheme rather than particular syllables or moras within the morpheme. In fact, all the languages of the eastern branch of the Tukanoan family share morphemic nasality꞉irst identified as such by Kaye 1971 for the Desano language꞉xcept for the Retua-ra/Tanimuka language. 4 Adjectival notions are expressed sometimes by nominal roots (-b꞊ue - ꞊ew, young , bik - 憉ature, old , more often by verbal roots (-rik -- 憉eavy , -cu - 惇ed , ac - 惇ot). Adverbs are nominal words. 5 In some languages such as Chaha, a Gurage language of Ethiopia, phonological considerations may override the realization of such morphemic features; see Petros 1997 for extensive discussion. 6 This behavior is also reminiscent of template replacement in the prosodic morphology of Yawelmani Yokuts (Newman 1944, Archangeli 1991). Yokuts stems fall into three lexically contrasting prosodic templates; but certain suffixes impose their own template (drawn from the pool of three basic types) on the root overriding the root꞉l inherent template. 7 Perhaps [+person] is a 憉eak feature like INFL in English (Chomsky 1995) that is lowered onto the verb while [-person] is a 挷trong feature like INFL in French that attracts the verb. 8 The accent copy is also reminiscent of tone sandhi in many Chinese dialects (e.g. Tianjin Chen 1986) where dissimilation is defined over Low-Low, Rise-Rise, and Fall-Fall tonal sequences. Compare also Yip (1989)꞉l tonal 挷ffricates and Pierrehumbert & Beckman (1988) who treat the [HL] pitch accent of Tokyo Japanese as a unit. 9 There is an uncanny parallel between this phrasal H and Pierrehumbert & Beckman's (1988) analysis of Tokyo Japanese where the L portion of a H+L phrase accent is realized on the first mora of the following accentual (minor)phrase. 10 See Oltra-Mausett (1999) for an analysis of verbal stress in Catalan that crucially refers to a phonologically empty tense node in the morphosyntactic feature representation.

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