BORNEO AND IRON: DEMPWOLFF'S *BESI REVISITED*

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ABSTRACT

The history of iron in the Austronesian world has long been puzzling. Although archaeological evidence for ironworking goes back no further than 200-500 BCE (Bellwood 1997:268), comparative linguistic data suggest a knowledge of iron that is much more ancient (Blust 1976). As noted by Blust (1999) the apparent discrepancy in these two lines of evidence is not irreconcilable, since a knowledge of iron does not necessarily imply a knowledge of ironworking. The purpose of this paper is to draw attention to certain loanwords that seem to indicate a significant change in the use of iron by Austronesian-speaking peoples in southwest Borneo, probably in the first two or three centuries BCE. The term 'southwest Borneo' is left deliberately vague, as its precise specification depends on determining the most likely center of dispersal of the Malayo-Chamic languages. Minimally, however, it can be identified with the area between the middle courses of the Sarawak and Kapuas rivers, with a probable extension southward to Tanjung Puting or beyond.

Although a familiarity with iron can be inferred for Austronesian-speaking peoples in Taiwan as early as 3500-4000 BCE (cf. PAN *bariS 'iron'), there is reason to believe that Borneo may have played an especially significant role in the transition from a knowledge of iron to a knowledge of ironworking. Christie (1988) has noted that English colonial writers as early as the 1830's commented repeatedly on the exceptionally high quality of iron ores found in the extensive lateritic soils of Borneo. Keppel in 1847, for example, stated that some sources of iron in Matan (a Malay-speaking area) were "fully equal in quality to the best Swedish iron," and Crawfurd (1856) maintained that "... of all the Archipelago, the country in which iron ore is best in quality and most abundant is Borneo." Since higher quality iron ores require less sophisticated technologies to extract the useful metal, it is likely that innovations in ironworking technology would have taken place in Borneo earlier than in other parts of insular Southeast Asia. There is, of course, extensive archaeological evidence for prehistoric ironworking in Borneo, most notably at a series of sites near Santubong in the Sarawak river delta (Harrisson and O'Connor 1969, Cheng 1969), dating from the tenth to the thirteenth centuries. Christie (1988) has reviewed the earlier interpretations of these sites as basically locales for foreign (Indian or Chinese) extraction of local materials, and found them problematic in various ways. Rather, she believes that ironworking at Santubong differed little from the practice of the indigenous Dayak populations as described by nineteenth-century European observers, but adds that "no archaeological data are yet available to illuminate the very earliest periods of iron production on the island of Borneo." The linguistic evidence relevant to the beginnings of ironworking technology in insular Southeast Asia fully supports Christie's interpretation of a purely indigenous development in maritime portions of southwest Borneo, and further enables us to associate this innovation with a particular linguistic community that can be dated roughly to the first two or three centuries BCE.

The foundations of Austronesian (AN) comparative linguistics were laid by the German medical doctor and linguist Otto Dempwolff, in his three-volume *Vergleichende Lautlehre des austronesischen Wortschatzes* (1934-1938). Volume 3 of this work is a comparative dictionary containing 2,216 'Uraustronesisch' reconstructions, together with supporting evidence drawn from a set of eleven languages reaching from Madagascar to Tonga. Despite this breadth of coverage it is now known that Dempwolff's reconstructed sound system is not Proto-Austronesian (PAN), but rather Proto-Malayo-Polynesian (PMP), regarded by many scholars today as the immediate ancestor of the non-Formosan AN languages. Moreover, about one third of Dempwolff's reconstructed vocabulary is not even PMP, but was either innovated in a temporally more recent proto-language, or is based on undetected loanwords that were widely disseminated in western Indonesia, the Philippines and occasionally beyond due to borrowing from Malay.[1]

One of Dempwolff's lexical reconstructions that has great potential interest to Southeast Asian prehistorians is *besi 'iron'. The supporting evidence that he gave for this etymon was Toba Batak (northern Sumatra) *bosi*, Javanese *wesi*, Malay *besi*, Malagasy *vi* 'iron', Fijian *vesi* 'name of a spear'. From the beginning some features of

this comparison were problematic. Not only does Fijian *vesi* diverge in meaning, but the established sound correspondences between these languages would lead us to expect Fijian **voci or possibly **vosi, not *vesi*. Moreover, Capell (1968) gives Fijian *vesi* as 'a very hard tree, *Intsia bijuga*; the name also of a spear from this wood'. For the Wayan dialect of Western Fijian Pawley and Sayaba (to appear) provide a similar gloss: *vesi* '*Intsia bijuga* ...coastal forest tree ... the wood is dark red-brown, hard and durable, and is valued for house-poles, furniture and household objects.' Given the absence of other likely cognates in Oceanic languages, along with the phonological irregularity and semantic discrepancy, Fijian *vesi* can be safely eliminated from the comparison Dempwolff proposed.

Once Fijian *vesi* is regarded as non-cognate, it is found that reflexes of Dempwolff's *besi are confined largely to western Indonesia. Where they appear in the Philippines they are found only in lowland languages, and show clear signs of borrowing, as with Tausug *basi'* 'iron' (*e normally becomes *u*, and together with the final glottal stop the change *e > *a* points distinctively to Brunei Malay as the source language). Where they occur in eastern Indonesia, as with Tetun *besi* 'iron' they are also clearly borrowed from Malay/Indonesian, although the age of the loan is uncertain and may be considerable in some cases. In the case of Tetun, Malay *besi* must have been borrowed after the regular sound change *b > *f* in this language, but presumably not very recently, since this word figures in a number of complex expressions which themselves do not appear to be borrowed, as with *besi asu* 'steel', *badain besi* 'blacksmith', *ahi besi* 'flint', *ba besi* or *halo besi* 'go to war', or *besi na'in* 'warrior' (Morris 1984). Given their frequent occurrence as loanwords, reflexes of *besi have been almost completely ignored in recent discussions of linguistic evidence for early Austronesian knowledge of iron (Blust 1976, 1999). However, certain linguistic comparisons that will be discussed below suggest that the history of this term may yet hold important information about the history of ironworking in insular Southeast Asia. Appendix 1 provides an overview of major terminology relevant to iron and ironworking in island Southeast Asia. Table 1 lists only attested reflexes of *besi. Where these exhibit irregular sound changes the expected form is also given, and the form is marked by (L) to indicate that it is a probable loanword:

The material in Table 1 provides useful information for culture-historical inferences. Where reflexes of *besi are phonologically irregular they probably are loanwords from Malay. That Malay is the most likely source language is clear from the larger pattern of lexical borrowing, as Malay loanwords are widespread in the coastal languages of Indonesia and the Philippines. Many of these must date back to the period before European contact with the region began at the time of the Magellan expedition of 1519-1521, since Antonio Pigafetta, the Italian chronicler of that voyage recorded a Malay vocabulary from speakers he encountered in the central Philippines. Malay merchants played a key role in the spice trade which transported nutmegs and cloves from their source regions in the central Moluccas to the Straits of Malacca, from whence they were trans-shipped to other destinations. Malay has thus probably been a language of trade and interethnic contact since at least the early Srīvijaya period in the late 7th century. Although Javanese loans are also found in some languages of western Indonesia (including Malay), and the southern Philippines, no other language of the region has had a contact influence that is even remotely comparable to that of Malay. This is evident from the fact that Malay loans in Javanese far outnumber Javanese loans in Malay, and similar disparities in degree of lexical influence are found in most other languages which have borrowed from both Malay and Javanese.

Forms that do not exhibit phonological irregularities are potentially native. However, conformity to regular phonological development does not exclude the possibility of borrowing. It is easy to show that Tagalog *tayubasi* 'iron filings' (Spanish: 'limaduras') is a loan, since PMP *e (schwa) regularly became *i* unless there was a rounded vowel in an adjacent syllable.[2] Similarly, Tetun *besi* 'iron' points to borrowing, since the inherited reflex of *b is *f-*, *-h-* (*batu > *fatu* 'stone', *beRas > *fos* 'husked rice', *bulan > *fulan* 'moon', *babuy > *fahi* 'pig', *babaw > *faho* 'to weed', *bukbuk > *fuhuk* 'wood weevil'). In many languages, however, such diagnostic developments are not available, and if Malay *besi* were borrowed there would be no phonological clue to identify it as a loan. Makasarese *bassi* 'iron', for example, can be derived from *besi by fully regular changes, but it is doubtful that this word is directly inherited. In the neighboring Buginese PMP *b became *w* or zero word-initially, but remained *b* following a prefix. Buginese *bessi* 'iron' thus suggests borrowing, and is included by Mills (1975:274) among words which in his view "are surely loans." A similar situation is found in Toba Batak, where the schwa of Malay loanwords is regularly nativized as *o* (*bodil* < Malay *bedil* 'firearm', *tombaga* 'copper' < Malay *tembaga*, ultimately from a Prakrit form with initial *a*). Toba Batak *bosi* 'iron' regularly reflects *besi, but whether this is due to direct inheritance or early borrowing is an open question. Both the South Sulawesi languages, of which Buginese and Makasarese are the largest and historically most influential representatives, and the Batak languages of northern Sumatra, have many Malay loanwords marked by distinctive phonological irregularities. Similar arguments can be applied to Javanese, which has borrowed heavily from Malay for over a millennium, and to Malagasy, which shows extensive evidence of early borrowing from Malay, probably through contact with Srīvijayan Malays in island Southeast Asia (Adelaar 1989, Dahl 1991).

Table 1. Attested reflexes of *besi in Western Austronesian languages.

LANGUAGE	LOCATION	FORM	EXPECTED
Tagalog	Luzon	tayubasi 'iron filings'	bisí (L)
Tausug	Mindanao	basi'	busi (L)
Kadazan	Sabah	bosi'	vosi (L)
Tombonuwo	Sabah	bosi	vosi (L)
Ngaju Dayak	SE Kalimantan	wasi	besi (L)
Malagasy	Madagascar	vi	
Mukah Melanau	C. Sarawak	besi 'iron' besey 'spear'	besey (L)
Singhi	S. Sarawak	bosi 'iron' bosis 'small axe'	bosis (L)
Kuching Bidayuh	S. Sarawak	besi 'iron' besis 'adze, mattock'	besis (L)
Iban	SW Sarawak	besi	
Maloh	W. Kalimantan	basi 'iron; bush knife'	
Malay	various	besi	
Proto-Chamic	Vietnam	*besey	
Toba Batak	N. Sumatra	bosi	
Simalur	Barrier Islands	besi(x)	
Sundanese	W. Java	beusi	weusi (L)
Rejang	S. Sumatra	besey	
Javanese	C. and E. Java	wesi	
Madurese	Madura	besse	
Balinese	Bali	besi	
Sasak	Lombok	besi	
Makasarese	S. Sulawesi	bassi	
Buginese	S. Sulawesi	bessi 'iron; spear'	wessi (L)
Komodo	Komodo	besi	wesi (L)
Manggarai	W. Flores	beci	weci (L)
Kambera	E. Sumba	bàhi	wohi (L)
Rotinese	Roti	besi(k)	fesi (L)
Savunese	Savu	ɓehi	wehi (L)
Atoni	W. Timor	besi	fesi (L)
Tetun	C. Timor	besi	fesi (L)

Given this larger pattern of borrowing and the weak evidence for assigning *besi an ancient pedigree, the probability that reflexes of *besi in these languages are Malay loans is fairly high. The matter is different, however, with the Chamic languages of mainland Southeast Asia. First, there is clear evidence that Malayic and Chamic are coordinate branches of a larger Malayo-Chamic subgroup (Blust 1992, Thurgood 1999).[3] The Malayic languages include Malay and its close genetic relatives in southern Sumatra and southwest Borneo. The Chamic languages include Cham, Jarai, Roglai, Rade and others in Vietnam, Laos and Cambodia, Tsat on Hainan island in southern China, and Acehnese in northern Sumatra. It is known that after its rise to power and commercial influence Champa was in contact with the Malay world. According to Chinese sources, in 774 and 787 CE the Cham capital suffered from 'invasions of Malays' (Maspéro 1928:97ff). Maspéro is careful to point out, however, that the invaders were mainly Javanese. Hall (1985:184-85) describes Cham-Javanese contacts of a different kind, including a Cham inscription dated 908-911 CE that reports two official diplomatic missions to Java, and a Javanese inscription of this period that refers to the activities of Khmer and Cham merchants in Java. Contact between speakers of Malay and Cham certainly occurred as well, both in the form of piracy and in the form of diplomatic relations at a distance. The geographic separation of these groups, however, makes it unlikely that this contact was nearly as intense as the interaction between Malay and other languages in western Indonesia (including Acehnese). Second, Thurgood (1999:287) reconstructs Proto-Chamic *bəsEy 'iron' with no indication that it might be borrowed. Since phonologically regular reflexes of this form are found throughout the Chamic languages (Acehnese, Rade, Jarai, Chru, Northern Roglai, Tsat, Haroi, Phan Rang Cham and written Cham), many of which have been located in interior plateau or mountain regions for centuries, there is no reason to doubt the validity of this reconstruction.

The earliest Chinese records for Champa, then located just south of modern Hue in central Vietnam, date from 192 CE or perhaps a bit earlier (Maspéro 1928), and since these describe an Indianized state that already had acquired some local power and influence it can hardly mark the arrival of Chamic speakers in coastal Vietnam. It seems a fair presumption, then, that Proto-Chamic speakers used a reflex of *besi 'iron' by 2,000 years ago or earlier. Since iron-working has been present both in the Malayic and the Chamic-speaking areas for at least that long (Bellwood 1997) there is no reason to believe that *besi referred to unworked meteoric iron ore. Rather, given Proto-Malayo-Chamic *bari and *besi 'iron', the most straightforward interpretation is that the former referred to unworked meteoric iron ore and the latter to worked iron. It has been argued that the Malayo-Chamic expansion into eastern Sumatra and mainland Southeast Asia began in southwest Borneo (Blust 1992). If so, an expanding population originating in southwest Borneo in the first few centures BCE presumably possessed the kind of traditional village-level ironworking technology that is attested throughout much of insular Southeast Asia during the historic period (Marschall 1968), and carried it with them to the Asian mainland.

The received view in Southeast Asian archaeology has been that ironworking technology originated on the Southeast Asian mainland and spread southward into the islands. Bellwood (1997:268), for example, maintains that the 'early Metal phase' in insular Southeast Asia "commenced with the introduction of copper-bronze and iron artifacts and their manufacturing technologies, presumably together (there is no separate "Bronze Age") and almost certainly from immediate sources on the Southeast Asian mainland during the last few centuries BC." He thus sees the appearance of metallurgy in insular Southeast Asia as a product of diffusion from a more northerly source. This source would have to be identified with coastal Mon-Khmer speaking peoples in Vietnam, since 1) Tai speakers at that time were located further north, 2) Tibeto-Burman speakers were located further west, and 3) early contact between Austronesian and Mon-Khmer speakers almost certainly would have occurred in the coastal zone. A similar view is expressed by Mahdi (1988:356), who apparently assumes that *besi was a lexical innovation in Chamic that spread southward into the Indonesian archipelago. If the Malayo-Chamic expansion led to rapid coastal settlement from the Malay peninsula to central Vietnam as suggested in Blust (1992), an extensive dialect chain would have existed for the first several centuries after this event. It is reasonable to assume that during this period lines of communication and cultural diffusion were maintained along much or all of this chain, and that an innovative ironworking technology could have spread in either direction before Malayic and Chamic were clearly differentiated groups.

Although many Mon-Khmer-speaking groups traditionally practiced ironworking with simple bamboo bellows, much like their Austronesian-speaking contemporaries further to the south, words for 'iron' in these languages generally show no resemblance to *besi.

There is, however, one outstanding exception to this statement. Shorto (1971:266) cites Old Mon *birsey* ([bərsɔy]), Middle Mon *basay* ([bəsɔy]) 'iron', with attestations from a number of inscriptions produced between the sixth and sixteenth centuries. On somewhat shakier grounds he suggests possible cognates in Western and perhaps Northern Mon-Khmer. There can be no question that this term is related to *besi. Two very brief comments that are included in Shorto's citation of data merit notice. First, he states that this probably is a loanword from 'Indonesian'. Second, the possibly related Khmer form *bamsyy* 'zinc' is said to contain a "different infix", implying that the second consonant of Old Mon *birsey* was not considered part of the base.[4]

While Old Mon *birsey* as documented by Shorto is based on dated inscriptions which do not go back as far as the likely period of initial contact between Austronesian and Mon-Khmer speakers, comparative evidence also supports the reconstruction of a similar term for Proto-Monic at a presumably earlier period. Based on cognates in contemporary Nyah Kur of central Thailand and Mon of lower Burma, Diffloth (1984:140) reconstructed Old Mon *prsəy 'iron'. He argues (1984:1) that "Old Mon was spoken in the Dvarāvatī Kingdom of Central Thailand in the VIth to IXth centuries A.D," and that "the Nyah Kur people are probably the direct descendants of Dvaravati society." In two accompanying maps he shows the locations of Old Mon inscriptions together with approximate dates associated with them, and the current location of Nyah Kur speakers (1984:6, 12). The earliest inscriptions, from the sixth to the ninth centuries, concentrate around the head of the Gulf of Thailand, with later inscriptions found mostly further north. In a note to the reconstructed form Diffloth comments that *prsəy "clearly represents a borrowing by Dvarāvatī society from some Austronesian language. The *-r- is unique to Monic."

The one conclusion that appears unassailable in this set of observations is that Malayo-Chamic and Monic speakers were in contact by at least the sixth century CE, when the term *birsey* 'iron' begins to appear in the Old Mon inscriptions from central Thailand. Needless to say, the appearance of a term in the inscriptions does not mark the beginning of its presence in the language, and contact between these groups may well have begun centuries earlier. This is consistent with the scenario sketched in Blust (1992), where it was argued that Malayo-Chamic speakers almost certainly spread from southwest Borneo into eastern Sumatra, the Malay peninsula, and up the coast of mainland Southeast Asia as far as central Vietnam. Diffloth's maps show Old Mon squarely in the path of this population expansion, concentrated around the head of the Gulf of Thailand in its earliest inscriptional attestations.

In principle the distribution of words resembling *besi in Mon-Khmer and Austronesian languages is open to either of two explanations. First, the word could have

been an innovation in Proto-Monic that was borrowed by Malayo-Chamic speakers who learned about ironworking technology when the two groups came into contact during the Malayo-Chamic expansion into mainland Southeast Asia. Neither Shorto (1971:266) nor Diffloth (1984:140) supported this view, but it is now favored by Diffloth (p.c.). Second, as suggested earlier, *besi could have been an innovation in Proto-Malayo-Chamic that was spread along with ironworking technology during the Austronesian settlement of mainland Southeast Asia. If the first hypothesis is adopted it must be assumed that the newly acquired ironworking technology and the word *besi spread in both directions along the Malayo-Chamic dialect chain. As will be seen below, this creates special problems in explaining reflexes of *besi in southwest Borneo. If the second hypothesis is adopted it need only be assumed that early Monic speakers borrowed ironworking technology and the word *besi from Malayo-Chamic immigrants who were then settling the coastal zone of the Gulf of Thailand.

The strongest evidence for diffusion of ironworking technology from mainland to island Southeast Asia would derive from an earlier radiocarbon chronology in connection with ironworking in the former area as compared with the latter. But even this would be inconclusive, as it presupposes that ironworking technology in Southeast Asia was a single cultural innovation rather than a product of independent parallel developments that happened to coincide closely in time. The wider global picture for the development of smelting and forging of iron, suggests that the ethnographically attested distribution of ironworking technology was a product of multiple independent inventions. Despite the earlier presence of ironworking in Egypt, for example, where it evidently was acquired by diffusion from the Middle East, West African traditions of blacksmithing, appear to reflect a development in situ, beginning with the Nok culture of central Nigeria around 500 BCE (Falola 2000:64-67, Connah 2004:51-56). Given the evidence for independent development of iron smelting and forging in other parts of the world, it is therefore difficult to exclude this possibility in considering the history of ironworking technology in Southeast Asia.

There are two quite distinct reasons to believe that *besi referred to worked iron rather than meteoric iron ore. First, as already noted, this term evidently was innovated at about the time that evidence for the practical use of iron first appears in island (and mainland) Southeast Asia. Second, *besi replaced an earlier term for 'iron' which is preserved in Iban, and hence must have been present in Proto-Malayo-Chamic. As noted in Blust (1976), this term is *bari 'iron', attested in Palawan Batak *bari-bari* 'iron; metal', and Iban *besi bari* 'steel'. This may be a tenuous basis for a reconstruction *bari, but it can now be strengthened by *bāri* 'iron' in Tabun of northern Sarawak (Ray 1913:173), as well as by Kavalan (eastern Taiwan) *baris* 'nail; iron, metal', and Thao (central Taiwan) *balis* 'iron'. The last form is irregular, and is almost certainly borrowed, as it shows the diagnostic irregularities *b > *b*, *l/r > *l*, and *S >*s* characteristic of Bunun loanwords in Thao (Blust 1996). Taken together, the total body of evidence thus supports a possible PAN *bariS, preserved as Proto-Malayo-Chamic *bari. Since this term can be attributed to a proto-language with a time-depth of at least 5,500 years it must have referred to raw iron ore or meteoric iron, raising the presumption that the lexical innovation *besi, which coexisted with *bari in Proto-Malayo-Chamic, carried a different signification. This leads us to the final complication in Table 1: both Mukah Melanau and two known Land Dayak languages have lexical doublets, the phonologically regular word referring to a particular type of implement made from iron (spear, small axe), and its partner to iron in general. What can this kind of distribution possibly mean?

To answer this question it will be helpful to first consider briefly the nature of doubletting in languages generally. Doublets are phonologically and semantically divergent forms of the same original word. These usually result from a pattern of borrowing in which one variant is directly inherited and the other borrowed from a sister language that underwent a somewhat different set of changes. However, doublets may also come about as a result of borrowing from the same source language at different periods of history. English *shirt* (native) and *skirt* (Danish loan) is an example of the first and by far most common type of doublet. English *wine* and *vine* is an example of the second, and far rarer type. Both *wine* and *vine* derive ultimately from Latin *vīnum*. Since wine is easily transportable while viniculture is sensitive to climate and requires extensive knowledge to practice, it might be expected that *wine* was borrowed first and *vine* later.

This expectation is confirmed by both linguistic and textual evidence. According to the Oxford English dictionary, the earliest textual attestation of *wine* in English dates from the composition of the epic of Beowulf (805-831). Anglo Saxon had no phoneme /v/, and *vīnum* was consequently borrowed with initial /w/. The earliest citation for *vine* in the OED dates from 1300, and by this time English had acquired initial *v-* as a result of extensive borrowing from Norman French. The second borrowing of Latin *vīnum* consequently differed both in form and in meaning from the first.

The question we must ask next is whether the doublets seen in Mukah Melanau *besey* 'spear' : *besi* 'iron', Singhi *bosis* 'small axe' : *bosi* 'iron', or Kuching Bidayuh *besis* 'adze, mattock' : *besi* 'iron' are comparable to English *shirt* : *skirt*, or rather to *wine* : *vine*. In other words, is one form native and the other borrowed, or were both forms borrowed, but at different historical periods? To answer this question we need to get a sense of the subgrouping relationships of these languages both to Malayo-Chamic and to one another. Mukah Melanau is part of a dialect chain that stretches about 170 miles along the coast of Sarawak from Balingian in the north to the mouth of the Rejang river in the south. Kanowit, spoken around the town of the same name some 80 miles up the Rejang

river, forms part of this chain, but is geographically separated from the other Melanau dialects/languages. The Land Dayak (or Bidayuh) languages form a geographically fairly compact and linguistically homogeneous cluster in southern Sarawak and adjacent parts of West Kalimantan.

Despite a paucity of descriptive materials and a longstanding history of borrowing from Brunei Malay, it is clear that the Melanau languages are very distinct from Malay, and hence from the larger Malayo-Chamic group.[5] Virtually all lexical items on a modified form of the Swadesh 200-word basic vocabulary that are shared with Malayic languages are demonstrable retentions from Proto-Malayo-Polynesian or fairly transparent loans from Malay. Very similar observations apply to Singhi and Kuching Bidayuh. To summarize, neither Melanau nor Land Dayak languages show evidence of an immediate subgrouping connection with Malayo-Chamic. Moreover, whereas Iban shares about 65% of its basic vocabulary with Malay (Blust 1988b:3), cognate percentages between Malay, Mukah Melanau and Singhi are much lower: Malay : Mukah 61/190 = 32.1%, Malay : Singhi 53/198 = 26.8%, Mukah : Singhi 64/190 = 33.7%.

It is unlikely, then, that Malayo-Chamic languages shared a common ancestor with either Melanau or Land Dayak more recently than about 3,500 BP. Since the archaeological record tells us that this is too early for the presence of worked iron it is difficult to justify an inference that either reflex of *besi is directly inherited in Melanau or Land Dayak languages. In other words, Mukah *besey* and *besi*, or Singhi *bosis* and *bosi* resemble English doublets like *wine* and *vine* rather than English doublets like *shirt* and *skirt*, and we must conclude that a reflex of Proto-Malayo-Chamic *besi was borrowed twice in the history of these languages. Any attempt to date the time of borrowing in absolute terms would be speculative, but it is possible to say that Mukah must have borrowed *besey* before the breaking of final *i and *u to *–ey* and *–ew* respectively, and *besi* after this historical change. Similarly, we can be fairly sure that Singhi borrowed *bosis* before the addition of final *s* after *-*i*, but *bosi* after this striking phonological innovation (Blust 1993). While this does not provide us with an absolute chronology, it does yield a relative chronology based on the order of sound changes in relation to the acquisition of loanwords, and this tells us that early borrowings of this term referred to specific tools or weapons made of iron, while later borrowings referred to iron in general.

With these well-supported inferences in mind it is useful to note that despite considerable searching, double reflexes of *besi have been found only in Melanau and Land Dayak languages, both of which have been located near the hypothetical Malayo-Chamic homeland in southwest Borneo for an indeterminately long period. Moreover, reflexes of *besi must have been borrowed into these languages separately, since they were already well differentiated by the time *besi was innovated. The doublets in Melanau and Land Dayak are thus products of independent histories of double borrowing that are curiously parallel. This is an unusual pattern, and calls for a special explanation.[6]

Several observations are relevant to explaining this peculiar loan distribution. First, as noted already, *besi 'iron' apparently must be reconstructed for Proto-Malayo-Chamic, the language of a population that almost certainly began to expand out from southwest Borneo during the first few centuries BCE (Blust 1992, Thurgood 1999). Second, no Malayo-Chamic language is known to have double reflexes of *besi, even though many languages belonging to this group are located in southwest Borneo. Third, early borrowings of *besi refer to specific manufactured objects --- spears in the case of Mukah, small axes or adzes in the case of Singhi or Kuching Land Dayak, while later borrowings refer to iron in general.[7] It is important to point out that this pattern is not consistent with borrowing from Malay at two different historical periods, since Malay *besi* refers only to iron, never to spears (Malay *tombak*) or axes (Malay *kapak*). If Mukah *besey* or Singhi *bosis* were Malay loanwords there would be no explanation for the semantics of these forms. Indeed, it would be necessary to accept the conclusion that Melanau and Land Dayak languages had not only independently borrowed the Malay word *besi* 'iron' twice, but that in both languages the earlier loanword underwent a parallel semantic shift from its source while the later loanword did not. This is clearly implausible, and suggests instead that the first borrowing of *besi into Melanau and Land Dayak languages occurred prior to the existence of Malay as a distinct language or of ironworking technology outside the Proto-Malayo-Chamic linguistic community.

The pattern of double borrowing seen in southwest Borneo is also difficult to reconcile with a hypothesis that ironworking technology diffused into the island world from early Monic speakers further north. On general practical grounds it is reasonable to assume that a trade in iron tools preceded the diffusion of smelting and forging technology, yet this trade in iron tools is reflected linguistically only in southwest Borneo. In short, the term *besi appears to have had a longer history in southwest Borneo than in other parts of island or mainland Southeast Asia, hence implying a similar antiquity for its material referent. More generally, the distribution of Malayo-Chamic languages provides clear evidence for a dramatic population expansion out of southwest Borneo northward into mainland Southeast Asia, beginning in the first two or three centuries BCE. Although such expansions are known even with hunter-gather populations (e.g. Pama-Nyungan in Australia), and the causes are often difficult to fathom through unassisted inference, the acquisition of ironworking technology could well have been a triggering factor in this event, as has been argued for the Bantu expansion from west Africa throughout much of the eastern and southern portions of the continent (Phillipson 1976). By contrast, early Monic speakers were relatively stationary, and at least part of their territory lay squarely in the path of a dynamically expanding population.

These observations are consistent with a single hypothesis: whereas lumps of meteoric iron (*bariS) probably had a magico-religious significance among Austronesian-speaking peoples for millennia, ironworking was innovated by ancestral Malayo-Chamic speakers during the first several centuries BCE. The tools and weapons that this discovery made possible may have contributed to the population expansion leading to the Austronesian settlement of mainland Southeast Asia. As with technological innovations in other parts of the world, the new idea easily spread beyond its community of origin, initially via trade in which iron tools must have figured prominently. Neighboring groups, such as early Melanau and Land Dayak speakers, would have acquired a reflex of *besi as the name of iron trade articles, without yet possessing the technology for working iron, much as English acquired a word for 'wine' before there was any knowledge of viniculture. Since the technological innovation took place in the ancestral Malayo-Chamic community there was no need for these languages to borrow a reflex of *besi, and we consequently would not expect them to show double reflexes of *besi any more than we would expect Spanish, French or Italian to have doublets like English *wine*, *vine*. In time a knowledge of metallurgy spread, first reaching those communities closest to the center of origin, and when it did a reflex of *besi was borrowed again, this time not as the name of a specific tool or weapon, but rather as the general term for 'iron'.

Many aspects of this important cultural innovation cannot easily be retrieved from the surviving linguistic evidence. In addition to *besi, Dempwolff (1938:110) reconstructed *panDay 'clever', and reflexes of this word are widespread in western Indonesia and the Philippines in the meaning 'blacksmith': Old Javanese *panDe/panDay* 'skilled worker; smith, goldsmith, etc.', Modern Javanese *panDe* 'forge, smithy; blacksmith; intelligent, skilled; an expert, specialist', Balinese *pande besi* 'blacksmith', Malay *pandai* 'artist-craftsman; expert; specialist ... Properly an industrial artist, in contrast to a mere skilled artisan' (Wilkinson 1957:839), Toba Batak *pande bosi* 'blacksmith', *pande kau* 'carpenter', Karo Batak *pande* 'iron smith' (Loeb 1972:26), Makasarese *panre bassi* 'blacksmith', *panre bulaeng* 'goldsmith', *panre kayu* 'carpenter', Tae' *pande bassi* 'blacksmith', *pande bulaan* 'goldsmith', Pamona/Bare'e *pande kaju* 'carpenter', *pande wuyawa* 'goldsmith', *pande salaka* 'silversmith', *pande labu* 'blacksmith', Cebuano *pandáy* 'forge; blacksmith, carpenter', Bikol *pandáy* 'craftman, smith; blacksmith, carpenter, electrician, etc.', Tagalog *pandáy*, *pandáy bákal*, Ilokano *pandáy* 'blacksmith'. Dempwolff marked *panDay as an Indic loan, and Gonda (1973:170-171) considers a possible Sanskrit etymology, but without reaching any definite conclusion. Reflexes of this word (hereafter *panday) are unknown in Chamic languages, and Thurgood (1999) did not reconstruct a Proto-Chamic word for 'smith'. Whatever its history, then, there is no known basis for crediting *panday with the same antiquity as *besi, whether it is a native term or an Indic loan. Most forms of this word are transparent borrowings of Malay *pandai* that must have been acquired within the past 500-1,000 years, hence well after the advent of metallurgy in insular Southeast Asia. Since Malay was a language of great importance in trade throughout the Indonesian archipelago and portions of the Philippines it is likely that Malay-speaking smiths formed part of many trading voyages. As a result, Malay *pandai* would have been borrowed even before (or instead of) *besi* in many languages of Sumatra, Sulawesi or the Philippines, giving it a wider distribution than the term for 'iron', despite of (or perhaps because of) its more recent origin.

We are left, then, with a hypothesis of the following form: (1) the smelting and forging of iron ore was a cultural innovation in the ancestral Malayo-Chamic speech community in southwest Borneo during the first few centuries BCE, and forged iron was called *besi, (2) this innovation presumably played a role in triggering the Malayo-Chamic expansion into eastern Sumatra, the Malay peninsula and the coast of Indochina as far north as central Vietnam, (3) whether it was independently invented by Mon-Khmer speakers or not, metallurgy must have been part of the cultural inventory that was carried northward into mainland Southeast Asia during this expansion, (4) ironworking technology and the word *besi were borrowed from Malayo-Chamic speakers by early Monic speakers whose territory at that time reached the Gulf of Thailand; this borrowing occurred early enough for the word to undergo subsequent sound changes and possible morphological modifications through infixation, (5) distinct language groups that were geographically adjacent to the ancestral Malayo-Chamic community, including the early Melanau and early Bidayuh, acquired trade articles made of iron from Malayo-Chamic speakers, using the word *besi for them, (6) as a result of sound changes in the Melanau and Land Dayak languages the early loanword *besi underwent modifications in pronunciation, (7) at a later time a knowledge of metallurgy spread locally in central and western Borneo, and the word *besi was borrowed again, but now in reference to iron itself, and in a form that has remained closer to its original shape, (8) at some point well after the innovation of *besi the word *panday was innovated in an early form of Malay, probably spoken in southern Sumatra or the Malay peninsula, to refer to skilled artisans working in wood, gold, silver and iron, (9) probably in late Srīwijaya times a knowledge of metallurgy diffused more widely into northern Sumatra, Sulawesi and the Philippines, and the word *panday acquired an even wider distribution through borrowing than *besi.

NOTES

1. It is unclear when Malay became a major source of loanwords. Hall (1985) states that the Indianized state of Srīvijaya in southeast Sumatra (which was Malay-speaking) "dominated maritime commerce passing through Southeast Asia between A.D. 670 and 1025." However, Malays controlled trade through the Strait of Malacca by the fifth century or earlier.

Before Malay influence could be widely felt, it was necessary for the use of Malay as a trade language to be extended beyond its home range of southern Sumatra and the Malay peninsula. This must have begun with the spice trade and continued through the introduction of Islam, but the dates for earliest involvement of Malay-speaking merchants in pan-archipelagic trade networks remain speculative.

2. Dempwolff (1938) actually reconstructed doublets *basi and *besi, assigning Tagalog *tayubasi* 'iron filings', Ngaju Dayak *wasi* 'iron' and Malagasy *basi* 'flint' to the former variant. However, as Dahl (1976:106) has noted, the comparative evidence supports only *besi.

3. Adelaar (2005:5) posits a larger 'Malayo-Sumbawan' group with a 'Malayo-Chamic-Bali-Sasak-Sumbawa branch'. Within the latter he regards 1. Bali-Sasak-Sumbawa, 2. Malayic and 3. Chamic as three coordinate branches. My own feeling is that Malayo-Chamic almost certainly forms a unit, even if it is within the larger grouping proposed by Adelaar.

4. Diffloth (pers. comm.) questions the Khmer form given by Shorto, suggesting that it may contain an infix –N- rather than –m-.

5. Apart from short vocabularies (Ray 1913) and several cursory treatments of selected aspects of the phonology and grammar of Dalat Melanau by I.F.C.S. Clayre, little material is available for any form of Melanau. The longest publication is Blust (1988a), a 66-page sketch of the phonology and morphology of Mukah. In 1971 the writer collected vocabularies of 600-700 words and basic grammatical data for Balingian, Mukah, Dalat Kampung Teh, Dalat Kampung Kekan, Matu, Sarikei, and Kanowit. These clearly form a dialect chain and exclude Bintulu at the northern end, which is sometimes mistakenly included with Melanau because of shared cultural similarities based on the cultivation of sago.

6. The recognition of double reflexes depends critically on diagnostic sound changes, which may not be available in all languages. Maloh *basi* 'iron; bush knife' thus could represent a double layer of borrowing like that in Melanau and Land Dayak languages, but without concomitant phonological cues.

7. Haaland, Haaland and Rijal (2002:35) hold that "With the possible exception of ornaments, the first iron artifacts were daggers, followed by spear-points, and swords, while iron tools like hoes and axes occur later." It is not clear how they have determined this sequential ordering, but if one takes it seriously it implies that the borrowing of ironworking technology occurred first with early Melanau speakers (*besey* 'spear'), and only later with early Bidayuh speakers (*bosis*, *besis* 'axe; adze, mattock').

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APPENDIX 1

Terms for 'iron', 'forge' and 'bellows' in languages of island Southeast Asia

LANGUAGE	IRON	FORGE	BELLOWS
PHILIPPINES			
Itbayaten	vaxa'yang		
DgtC	aseho (< Span.) bákal (< Tag.)		
Ilokano	landók	panday-en pitpit-en	yubuyub-an
Bontok	landók (< Ilk.) pattaden walteng		opóop
Kankanaey	landók (< Ilk.)		
Itawis	balayáng		
Tagalog	bákal	panday-ín	bulús-an
Bikol	batbát lansáng	lukás	tayóp
Cebuano	putháw	salsál	
Maranao	potao	tonag-aq	tatapan
WBM	putew	salsal	

Binukid	puthaw	salsal	
Tiruray	futow		tatafan
Mapun	bassi	baba	
Yakan	basi'	babal	
BORNEO			
Kadazan	bosi	mod-supu'	
Tarakan	basi		
Kelabit	belawan	n-aar	aar
Kayan	behari'		
	titey keluh		
SUMATRA			
Toba Batak	bosi	topa	bopbopan
			pan-dusdus-an
Simalur	besi(x)	tepa	abon
		totu'	
MAINLAND SE ASIA			
Jarai		reday/keday	ding reday
Malay	besi	menempa	embus-an
			puput-an
SULAWESI			
Sangir	eta'	se'sale'	onta'
	uase		
Mongondow	watoi	tontaL	ountapan
Bare'e/Pamona	labu	lawáka	sondo
		palu	
Tae'	banding	tampa	sauan
	bassi (< Mak.)		
Makasarese	bassi	de'de'	puppukang
Muna	ghuti	rompu	
	garaga	titi	
LESSER SUNDAS			
Manggarai	beci	pépék	puput
Kambera	bàhi	pàha	ngàmbu
		tuku	bàhi ruru
Lamaholot	olak	iti'	rok
		tego	

Abbreviations: DgtC = Casiguran Dumagat, WBM = Western Bukidnon Manobo