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THE URALIC AND FINNO-UGRIC PHONETIC SUBSTRATUM IN PROTO-GERMANIC

"Perhaps the most common error made by historical linguists in weighing the evidence of language contact is to assume that a lack of numerous loanwords critically weakens the case for any structural interference." (Thomason-Kaufman 1988 : 42—43).

Proto-Germanic sound changes

The splitting off of Proto-Germanic from the Indo- European linguistic unity is marked by several sound changes. The most important of these are the following t h i r t e e n (see, for example, Krahe 1960 : 43—96; Haugen 1976; König 1978 : 43—83; Stedje 1989 : 44—46).

(1) I n i t i a l s t r e s s or the fixing of stress on the first syllable of the stem (*Akzentverschiebung/Akzentwandel*).

(2) Change of the q u a l i t y o f s t r e s s from a tonal to a more expiratory type and from a more or less even to a centralized type ("Expiratization" and "Centralization" of stress).

(3) F o o t I s o c h r o n y or the fact that the unstressed vowels were shorter and weaker after a long first syllable than after a short first syllable.

(4) G r i m m's L a w (*die erste/germanische Lautverschiebung*).

(5) V e r n e r's L a w (*das Vernersche Gesetz*).

(6) Merger of the palatal and velar p l a c e s o f a r t i c u l a t i o n in plosives.

(7) P a l a t a l i z a t i o n of consonants in the vicinity of *i/j*.

(8) Dissolution of the s y l l a b i c r e s o n a n t s into an *u* followed by the resonant in question.

(9) Vowel changes $\partial > a$ and $o > a$.

(10) Vowel change $\bar{a} > \bar{o}$.

(11) Monophthongization $ei > \bar{i}$.

(12) Vowel change $e > i$.

(13) A p o c o p e of *a* and *e*.

My contention is that each of these can be interpreted as a U r a l i c / F i n n o - U g r i c (henceforth U/FU) s u b s t r a t u m, which arose in a situation in which the native speakers of the U/FU protolanguage shifted their language to the

Indo-European (henceforth IE) protolanguage. To put it more plainly: All the main Proto-Germanic sound changes are originally pronunciation mistakes made by the ancient speakers of the U/FU protolanguage learning the IE protolanguage. To see where and when the U/FU > IE language shift took place a brief introduction into the relevant archaeological cultures and the assumptions concerning the languages used in these cultures is in order.

Cultures and languages

Of particular interest when seeking the potential area of the U/FU > IE language shift is the north European area of northern Germany, Denmark, and Scania (in southern Sweden). This is traditionally interpreted as the area where the Proto-Germanic tribe and language first emerged, and from where it later spread in practically all directions. The area is seen as area C on the map. In this area many archaeological cultures prevailed after the peak of the last glacial period until the beginning of the Bronze Age. The cultures in temporal order are the following (see, for example, Huurre 1995; Jensen 1982; Burenhult 1988):
(1) Hamburg, (2) Ahrendburg and Bromme, (3) Maglemose, (4) Kongemose, (5) Ertebølle-Ellerbeck, (6) TRB (Trichterbecher) and Pit Pottery, and (7) Single Grave and Battle Axe. These were followed by the Copper-Stone Age and the Bronze Age.

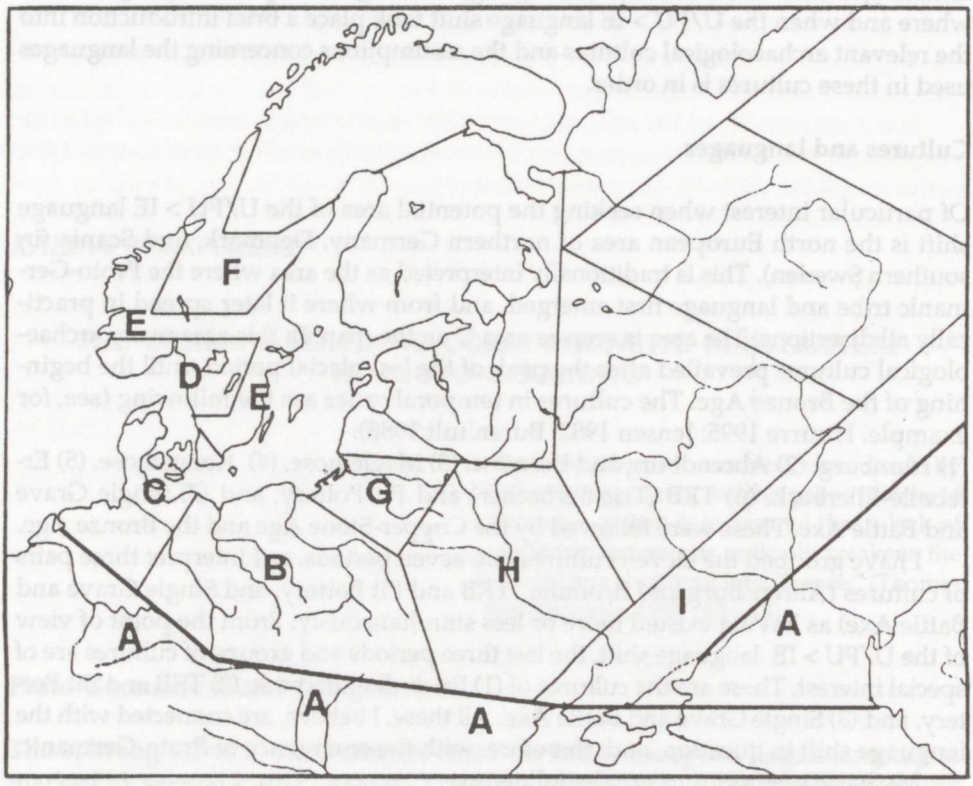
I have grouped the eleven cultures into seven periods, as I interpret three pairs of cultures (Ahrensburg and Bromme, TRB and Pit Pottery, and Single Grave and Battle Axe) as having existed more or less simultaneously. From the point of view of the U/FU > IE language shift, the last three periods and groups of cultures are of special interest. These are the cultures of (1) Ertebølle-Ellerbeck, (2) TRB and Pit Pottery, and (3) Single Grave and Battle Axe. All these, I believe, are connected with the language shift in question and, therefore, with the emergence of Proto-Germanic.

My basic assumptions are the following:
(1) The language of the north European hunting populations (among others those of the cultures of Ahrensburg, Bromme, Maglemose, and Kongemose) was P r o t o - U r a l i c (or actually one or more of its dialects), while the language of the populations of the more southernly situated areas (among others those of the cultures of LBK or Linear Pottery, Tripolye-Cucuteni and Kurgan) was P r o t o - I n d o - E u r o p e a n (or actually one or more of its dialects). This is the b a s i c p o s t u l a t e of the entire article — its truth is perhaps impossible to prove conclusively at the present stage, and yet practically all the contentions of the article are more or less dependent on it.
(2) The U/F U > I E l a n g u a g e s h i f t took place as the U/FU populations living next to the IE populations shifted their language to an IE language.
(3) The language shift resulted from the radical change in subsistence and population size connected with the first phase of a g r i c u l t u r a l e x p a n s i o n.
(4) The shift in subsistence and language took place both by cultural and demic diffusion, but the relative importance of c u l t u r a l d i f f u s i o n was much greater than that of demic diffusion or migrations. Accordingly, the model I use is typically "immobile": in most cases it does not presuppose movements of populations from one living site to another. Here I follow the current trends advocated by many modern archaeologists.

According to the model, the U/FU > IE language shift started in north Europe in the area where agriculture first arrived and moved from there toward the north. More specifically, the language shift started with the arrival of agriculture at the southern boundary of the area of the Proto-Uralic hunter-fishermen-gatherers in

Map

The cultural and linguistic areas of northern and eastern Europe.



The areas do not represent any one period; their purpose is to give a general framework for the developments dealt with in the text. The areas of north-western Europe where Proto-Germanic and Proto-Scandinavian emerged are shown in more detail than the other areas.

A = The northernmost zone of the food producers and the IE language about 5500 BC. The area of LBK culture in western and central Europe.

B = The northernmost area of agriculture in western Europe about 4200 BC and the northernmost area of the IE language about 3500 BC (the "Odra-Vistula area"); the area of the oldest north IE dialect with a U/FU substratum; perhaps the area of the northern IE protolanguage orthe Germano-Balto-Slavic protolanguage.

C = The northernmost area of agriculture about 3500 BC (the area of Ertebølle-Ellerbeck) and the area of the first phase of Proto-Germanic about 2800 BC.

D = The northernmost area of agriculture about 2800 BC (belonging to the area of TRB culture) and the area of the second phase of Proto-Germanic about 2300 BC.

E = The northernmost and easternmost areas of agriculture in Scandinavia about 2300 BC and the area of the first phase of Proto-Scandinavian (or the third phase of Proto-Germanic) about 1800 BC.

F = The northernmost area of agriculture about 1800 BC and the northern area of Proto- Scandinavian about 800 BC.

G = The assumed area of Proto-Baltic.

H = The assumed area of Proto-Slavic.

I = The area of the IE language based on the IE dialect of the steppe (Kurgan) area with a substratum of the U/FU dialect of the Lower Dnepr, Donets, and Lower Volga areas.

central Germany during the sixth millennium BC (for the arrival of agriculture in this area, see, for example, Piggot 1965 : 59; Clark 1965; Renfrew 1987 : 152—159; Huurre 1995 : 25). The language shift and the boundary between the U/FU and IE languages has moved northward ever since, so that today the language boundary is in northern Fenno-Scandia as the boundary between Norwegian/Swedish/Russian and Lappish/Finnish/Carelian. As mentioned above, only the first phases of the northward movement of this boundary are of interest in connection with the emergence of Proto-Germanic. Before a more detailed analysis of the movement of the language boundary, a more general treatment of the topic is in order.

The simplest possible alternative, when dealing with the movement of a language boundary in relation to that of a subsistence and cultural boundary, is that the two boundaries move hand in hand. If this were the case then, for example, the arrival of agriculture in the north German-Denmark-Scania area would mean the s i m u l t a n e o u s arrival of the IE language. It is, however, a commonly known fact (see, for example, Korhonen 1976 : 11) that a language shift often lags behind in time in relation to the shift of subsistence and culture: In a situation of thorough change, first the features of culture are changed and some linguistic features (like words belonging to the new culture) are borrowed, and only after a considerable time lag the language may be shifted. From the linguistic point of view there are, accordingly, two different phases: a b o r r o w i n g p h a s e and a s h i f t i n g p h a s e. The essential question is: How long does it take for the shifting phase to be completed after the borrowing phase, or how long is the "l i n g u i s t i c t i m e l a g"? The answer, no doubt, is that the time lag varies according to the situation in question. According to M. Korhonen, for example, the time lag might be of the magnitude of 500—1000 years. In this presentation, I solve the question tentatively in a very simple way: the time lag is "o n e c u l t u r a l p e r i o d". A basicly similar solution has been presented by N. Strade (1995). According to this solution (which is, no doubt, too simplified, but still worth presenting), the U/FU > IE language shift took place in the area of the Ertebølle-Ellerbeck culture during the period of the TRB culture, which is one step younger than the Ertebølle-Ellerbeck culture. The TRB culture represents the shifting phase and the Ertebølle-Ellerbeck culture the borrowing phase preceding it. The principle may seem odd at first sight, but upon closer examination it turns out that it actually is in common use. For example, many Finnish archaeologists agree that the Battle Axe culture and the Proto-Baltic language arrived in Finland in 2500—2000 BC, and that the Baltic population was assimilated into the aboriginal population during the next cultural period, that of the Kiukainen culture in 2000—1500 BC.

The following is a general scheme specifying the subsistence and language for three areas that are in different phases of development: the southern area has already changed its subsistence and language, the central area is on its way in the same direction, and the northern area has not yet been influenced by the new subsistence and language.

Hunting-fishing-gathering
U/FU language

Arrival of agriculture
Borrowing phase: the U/FU language with IE loanwords

Established agriculture
Shifting phase: the IE language with a U/FU substratum

The principle of the linguistic lag of one period is shown in the following scheme. The scheme is seen in a more graphic and summarized form than the map and table 1 below.

Phase 0 or the starting situation consists of the subsistence and language boundaries in central Germany around 5500 BC; see area A on the map and the lowest line (agr-IE) of column 0 of table 1.

Phase 1. Agriculture arrived in northern Germany, more specifically in the "O d r a-V i s t u l a a r e a" (area B on the map) with the spread of the central European LBK c u l t u r e to this area in 5500—4200 BC; see table 2, in which the cultures involved are specified. The U/FU > IE language shift started at the southern boundary of the Odra-Vistula area at the beginning of this period, but had not reached the northern boundary of the area by the end of the period; to simplify things, the language shift had not yet taken place (more specifically, it was not completed) in this area during this period, and the population of the northern part of the LBK culture (that of the Odra-Vistula area) consisted of farmers who still spoke a U/FU language. Their dialect, however, probably had some IE features. The situation in area B in 5500—4200 BC is summarized as the second lowest line of phase 1 in tables 1 and 2.

Phase 2. During the next cultural period (about 4200—3500 BC), agriculture spread to the north German-Denmark-Scania area (area C on the map and the third lowest line of phase 2 in tables 1 and 2), and the U/FU > IE language shift was completed in the Odra-Vistula area (compare the lowest and second lowest lines of phase 2 in table 1). The populations of the n o r t h G e r m a n-D e n m a r k-S c a n i a area that gradually changed their subsistence from hunting to agriculture were the former E r t e b ø l l e-E l l e r b e c k population (cf. the specifications agr-U and Erteb on the third lowest lines of phase 2 in tables 1 and 2). As seen from the specification U, the population had not yet changed its language, but some IE features had most probably arrived in their FU dialect. The populations changing their language from a U/FU to an IE language in the O d r a-V i s t u l a a r e a represented the first U/FU populations to learn an IE language and who, therefore, were the first to leave a U/FU substratum in an IE language. The IE language in question could (tentatively, at least) be called the n o r t h I E p r o t o-l a n g u a g e. This is the protolanguage that later (under various U/FU and perhaps other influences) split into the Germanic, Slavic, and Baltic proto-languages.

Phase 3. During the next cultural period (about 3500—2800 BC) of the T R B c u l t u r e, agriculture spread further north, reaching now the approximate l i n e o f O s l o-S t o c k h o l m in central Scandinavia (area D) leaving, however, the coastal regions of Scandinavia (area E) intact. With agriculture some IE linguistic features now also reached the FU dialect of the area. The c o a s t a l a r e a belonged to the S c a n d i n a v i a n P i t P o t t e r y c u l t u r e (Finnish *Skandinaavinen kuoppakeramiikka* or *Itä-Ruotsin asuinpaikkakulttuuri*). The basis for this temporary halt of the spread of agriculture in central Scandinavia was the fact that it had now reached the northern boundary of the broad-leaved tree forests (Swedish *edellövskogar*), and the simple agriculture of the time was not yet suited for other types of forest areas and colder climate (Burenhult 1988 : 69). The basis for agriculture not to spread to the coastal regions at once was perhaps that the populations of the coasts were well enough off with their own subsistence, that of fishing, seal hunting, and pig raising, not yet feeling a great attraction to the new subsistence. In the north Germany-Denmark-Scania area the farming population now learned to speak an IE language and gradually shifted their FU language to an IE one. This language shift is the primary concern of this article because it desig-

nates the emergence of the oldest type of Proto-Germanic (Pre-Germanic?). As mentioned above, Proto-Germanic is that daughter language of the IE protolanguage that has a strong U/FU substratum (more precisely, that of the "Maglemose/Kongemose" or "Ertebølle-Ellerbeck" dialect). To show that this really is the case, it is my purpose in this article to give phonetic evidence for the fact that practically all the Proto-Germanic sound changes are (or more cautiously can be) of a U/FU substratum.

To summarize, during this period, (a) the populations of south Swedish inland regions were already farmers, but they still spoke a FU language, (b) the populations of the south Scandinavian coasts (Pit Pottery) were, basically, fishermen, seal hunters, and pig raisers whose language, likewise, was a FU one, and (c) the populations of north Germany-Denmark-Scania (the former Ertebølle-Ellerbeck area) were farmers who already had learned to speak an IE language, the oldest variety of Proto-Germanic.

Phase 4. The fourth period is that of the Single Grave and (Scandinavian) Battle Axe (about 2800—2300 BC). The essential outcomes of this period are that (a) agriculture has spread to certain areas north of the Oslo-Stockholm line and also to the coastal areas of the former Pit Pottery culture (area E on the map) and (b) the farming population of the Swedish inland area is shifting its language from a Finnic to a Germanic one (area D on the map). In Scandinavia, the type of agriculture of the Battle Axe subsistence system reached its northern boundary, and the progress of agriculture slowed down and even came to a halt. This was analogous to the spread of the Battle Axe culture in Finland in 2500—2000 BC. The language shift signifies the emergence of the second stage of Proto-Germanic (Mid-Germanic?). (What the exact linguistic differences between the first and second stages of Proto-Germanic are is not dealt with in this article. In general terms, the main difference between the two is that the U/FU substratum is stronger in the latter stage.) In addition to the developments in Scandinavia dealt with above, similar developments took place in the more western and eastern areas of central Europe. These areas (particularly that of the Single Grave culture) also belonged to the scope of the second stage of Proto-Germanic.

The Scandinavian areas (see area E on the map), having now the first contacts with agriculture, may also linguistically signify a counterpart to the Finnish and Estonian Battle Axe areas on the northern and eastern coasts of the Baltic Sea. In the Finnish and Estonian Battle Axe areas a new Pre-Finnic dialect arose thanks to the strong Baltic influence caused by the spread of agriculture. The new dialect is that of Finnic (*myöhäiskantasuomi* or *itämerensuomi*), and it can be symbolized as PF + b (read: Pre-Finnic with a Baltic substratum). Supposing that a corresponding development also took place in Scandinavia and there probably being no (or only slight) Baltic influence (but a strong Germanic influence instead), the FU dialect of the E area on the map may represent a Scandinavian counterpart for the traditional Finnic protolanguage. The formula for this hypothetic "western Finnic dialect" is PF + g (read: Pre-Finnic with a Germanic substratum). The populations of the more northernly situated areas of Scandinavia (north of area E on the map), corresponding to the inland and northern areas of Finland, did not change their subsistence in this phase and, therefore, did not have a strong Germanic influence. They remained more or less at the Pre-Finnic linguistic stage, and are now called the Proto-Lapps. If this really is the case, the dialect boundary (later language boundary) between Proto-Finnic and Proto-Lappic ran from the Viipuri area in southeastern Finland to the Kokkola area in western Finland (along the traditional

northern boundary of the Battle Axe culture) and continued across the Bothnian Bay and Scandinavia to the Atlantic coast (see the northern line of area E). To summarize, the FU populations of Scandinavia also represented two linguistic groups, those speaking Proto-Finnic (its western or Scandinavian dialect) and those speaking Proto-Lappic.

Phase 5. The fifth period is the Copper-Stone Age (Swedish *kopparstenåldern*) of 2300—1800 BC (Burenhult 1988), during which the subsistence boundary gradually moves to the southern parts of Norrland (the northern boundary of area F) and stops there for some time. The language boundary now reaches the northern boundary of the former Battle Axe culture (the northern boundary of area E) and the eastern coast of southern and central Sweden. From the language point of view, this period may mean the emergence of the first phase of Proto-Scandinavian (North Germanic) (or it may be interpreted as the final stage of Proto-Germanic or perhaps "Late-Proto-Germanic").

Phase 6. During the next period of about 1800—800 BC the subsistence boundary stays unchanged and the language boundary catches up with it. The two boundaries coincide in 800 BC and for some time from the year 800 BC onwards the boundary in southern Norrland (the northern boundary of area F) forms the boundary between the Lapps and the northernmost tribe of the Proto-Scandinavians (Burenhult 1988 : 236). The period of 1800—800 BC signifies perhaps the second stage of the Scandinavian protolanguage. (If stage 5 is interpreted as the last stage of Proto-Germanic, stage 6 represents the initial stage of Proto-Scandinavian.) The Proto-Scandinavian linguistic period did not end in 800 BC, but continued until the end of the Viking period in 1050 AD (Haugen 1976).

Table 1

Subsistence and languages in the western parts of northern Europe

Phase⇨	0	1	2	3	4	5	6
BC⇨	5500	4200	3500	2800	2300	1800	800
	hunt-U	hunt-U	hunt-U	hunt-U	hunt-U	hunt-U	hunt-U
	hunt-U	hunt-U	hunt-U	hunt-U	hunt-U	hunt-U	agr-U
F	hunt-U	hunt-U	hunt-U	hunt-U	hunt-U	agr-U	agr-IE
E	hunt-U	hunt-U	hunt-U	hunt-U seal-U	agr-U	agr-IE	agr-IE
D	hunt-U	hunt-U	hunt-U	agr-U	agr-IE	agr-IE	agr-IE
C	hunt-U	hunt-U	agr-U	agr-IE	agr-IE	agr-IE	agr-IE
B	hunt-U	agr-U	agr-IE	agr-IE	agr-IE	agr-IE	agr-IE
A	agr-IE	agr-IE	agr-IE	agr-IE	agr-IE	agr-IE	agr-IE

The Y-axis (geographic areas) represents roughly the south vs. north dimension of the map of western Europe. The X-axis (periods 0 through 6) represents the temporal periods from about 5500 BC to the present time.

Specifications:

(a) subsistence: hunt = hunting-fishing-gathering; seal = seal hunting-fishing-pig raising; agr = agriculture-stock raising

(b) language: U — Uralic; IE — Indo-European

The "pioneering" areas and periods: single underlining = arrival of agriculture; double underlining = language shift. For example, symbols agr-U on the line D in column 3 show that the population living in area D (the inland of southern Sweden) during phase 3 (3500—2800 BC) were farmers who spoke a Uralic language with borrowed elements from Indo-European; their southern neighbours (agr-IE) were farmers who spoke an Indo-European language with Uralic substratum and their northern and eastern neighbours (hunt-U and seal-U) were hunters and sealhunters who spoke a more or less "pure" Uralic language.

Table 2

The archaeological cultures of the areas and periods of table 1

Phase⇨	0	1	2	3	4	5	6
BC⇨	5500	4200	3500	2800	2300	1800	800
	Komsa	Slate-Q	Slate-Q	Slate-Q	Asbest	Asbest	Asbest
	Fosna	Slate-Q	Slate-Q	Slate-Q	Asbest	Asbest	**Bronze**
F	Fosna	Slate-Q	Slate-Q	Slate-Q	Asbest	**Cop-St**	**Bronze**
E	Hensb	Slate-Q	Slate-Q	Slate-Q Pit-Pott	**BattA**	**Cop-St**	Bronze
D	Hensb	Slate-Q	Slate-Q	**TRB**	**BattA**	Cop-St	Bronze
C	Kongem	Erteb	**Erteb**	**TRB**	SingG	Cop-St	Bronze
B	Kongem	**LBK**	**TRB**	TRB	CordW	Cop-St	Bronze
A	LBK	LBK			CordW		Bronze

Asbest — Asbestos Ceramics; BattA — Battle Axe; Bronze — Bronze Age; Cop-St — Copper-Stone Age; CordW — Corded Ware; Erteb — Ertebølle-Ellerbeck; Hensb — Hensbacka; Kongem — Kongemose; LBK — Linear Band Ceramics; Pit-Pott — Scandinavian Pit Pottery; SingG — Single Grave; Slate-Q — Slate-Quarzite; TRB — Funnelneck Beaker.

Single underlining = arrival of agriculture; double underlining = language shift.

Table 2 has two types of "pioneering" cultures: in one of these occurs a subsistence shift and in the other a language shift. The cultures experiencing a subsistence shift are the following six:

(1) LBK culture in the Odra-Vistula area in 5500—4200 BC,

(2) Ertebølle-Ellerbeck culture in the north German-Denmark-Scania area in 4200—3500 BC,

(3) TRB culture in the inland area of southern Sweden in 3500—2800 BC,

(4) Battle Axe culture in central Scandinavia and the coastal areas of eastern Sweden in 2800—2300 BC,

(5) The Copper-Stone Age culture in central Scandinavia in 2300—1800 BC, and

(6) The Bronze Age culture (Scandinavian Bronze Culture) to the north of the preceding area in 1800—800 BC.

A language shift occurs in the following five areas and periods:

(1) in the Odra-Vistula area in 4200—3500 BC,

(2) in the north German-Denmark-Scania area in 3500—2800 BC,

(3) in the inland of southern Sweden in 2800—2300 BC,

(4) in the area north of the preceding area and in the coastal area of southern Sweden in 2300—1800 BC, and

(5) in the F area of the map in central Scandinavia in 1800—800 BC.

In addition to the Proto-Germanic and Proto-Scandinavian protolanguages in northwestern Europe, other north IE protolanguages arose in the more easterly situated areas. First perhaps a Balto-Slavic protolanguage was formed in the southwestern edges of areas G and H. Later the area was split into Proto-Baltic (area G) and Proto-Slavic (area H), both concentrating in two large water systems, the Proto-Baltic in that of Niemen (Memel or Nemunas) and the Proto-Slavic in that of Vistula. These protolanguages, too, were developed under substratal influence from other (probably U/FU) languages. I hint at some U/FU substratum features in the common north IE protolanguage (for example, the palatalization of consonants and the merger of the *o*-like and *a*-like vowels) in the text below, but I do not touch upon the U/FU substratum features of the Baltic and Slavic protolanguages separately; these are dealt with in detail in several other publications by, for example, Veenker 1967; Ki-

parsky 1969; Décsy 1967; Thomason, Kaufman 1988; Raukko, Östman 1994; Künnap 1996a.

There is still another potential area of U/FU substratum not touched upon in this article (see area I on the map). This area and its IE language is based on a more eastern Proto-Indo-European dialect, that of the Kurgan culture, which, when spreading to the west and northwest, came under the substratal influence of the U/FU speakers of the Dnepr-Donets culture (Gimbutas 1991). The emergence of the IE protolanguage in question does not, however, belong to the scope of this article.

The system outlined above results in what could be called the increasing degree of substarum: the further north the area of an IE language or dialect is, the stronger its U/FU substratum. The emergence of this situation can be sketched as follows. First a "pure" variety of the IE (a 100% IE) protolanguage is mixed with a "pure" U/FU language in a southern area, for example, immediately north of boundary A on the map. Supposing, for example, that in each language shift, the portion of the substratum in relation to the resulting language is 10 per cent, then the resulting language is of the type

90IE + 10U/FU.

Next this language is mixed with a "pure" U/FU language of the next more northern area, and again the U/FU language leaves a substratum of 10 per cent in the resulting IE dialect. The resultant IE dialect is now

90:100(90IE + 10U/FU) + 10U/FU = **81IE + 19 U/FU.**

In the third phase, the language shift and the IE dialect of the next more northern dialect is as follows:

90:100(81IE + 19U/FU) + 10U/FU = **72,9IE + 27,1U/FU.**

In this hypothetical example, the U/FU substratum in the IE dialects is 10 % in the southernmost area, 19% in the next more northern area, and 27,1% in the northernmost area. Even if it is not clear what the exact substratum percentage is (and if such a percentage can ever be ascertained in exact terms), the example, I hope, serves as an example of the general process resulting in the increasing substratum in the IE languages and dialects from south to north. The basic explanation for the increase of the U/FU substratum from south to north is the fact that the IE dialects forming the base for the next new mixed dialect is less and less "pure" and more and more "contaminated" by the U/FU language. In practice, the principle of increasing substratum is seen, of course, in the greater amount of U/FU substratum in the more northerly situated IE languages and dialects, and more generally in the fact that the main dialect boundaries of the IE languages in question (particularly those in Scandinavia) run generally from west to east. In gross terms, the Scandinavian dialect boundaries reflect the spread of agriculture and the temporal order of the language shift IE > U/FU in the areas under consideration.

Three reverse situations

It should be emphasized in connection with the arrival of agriculture in northern Germany, Denmark, and southern Sweden that by the "arrival of agriculture" is here meant the first expansion stage of farming and stock-raising of about 4200—3500 BC. There are three other stages (which in fact are stages of the improvement of agriculture and stock-raising) of (1) 2800—1000 BC, (2) 200—400 AD, and (3) 800—1000 AD (Jensen 1982 : 76). During these stages two developments took place. The main language boundary between the IE and FU languages continued moving to the north in Scandinavia and Balticum, and new IE populations arrived in the

Finnic areas of the northern and eastern coasts of the Baltic Sea. The latter development led eventually to the assimilation of the IE populations to the indigenous Finnic tribes (cf. the assimilation of the Baltic population of the Battle Axe Culture, the Germanic population of the Scandinavian Bronze Culture, and the Scandinavian population of the Roman Iron Age), and an IE adstratum/superstatum in the coastal dialects of the Finnic languages (cf. the Proto-Baltic, Proto-Germanic, and Proto-Scandinavian features particularly in the western dialects of Finnish, the northern and western dialects of Estonian, and the western dialects of Livonian). In many instances the IE features in the coastal dialects of the Finnic languages designate a return of the old U/FU linguistic features in a new (Proto-Germanic or Proto-Scandinavian) form to the Finnic languages.

In the rest of this article it is my purpose to show that the U/FU > IE language shift has really occurred. All my arguments are based on p h o n e t i c material for two reasons: (a) phonetics is my own field and (b) phonetic features (in addition to syntactic ones) are the most conspicuous substratal features left by the assimilating language in a situation in which a population of a lower social status (in this case, the hunters and speakers of a U/FU language) shifts its language to that of a socially higher status (that of the farmers and speakers of an IE language); very few if any lexical or morphological features are usually left as substratal features in this type of situations (Thomason, Kaufman 1988 : 37—45). It is, therefore, likely that there is a phonetic and syntactic U/FU substratum in Proto-Germanic, but practically no U/FU loan words or suffixes.

The thirteen Proto-Germanic sound changes

I next return to the thirteen Proto-Germanic sound changes mentioned at the beginning of this article and try to show that they really can be o f U/F U o r i g i n. If the considerations above are correct, the formation and spread of the sound changes started in north Germany about 3500 BC and ended in central Scandinavia (and on the part of the pre-stages of west Germanic and east Germanic, in the western and eastern parts of northern central Europe) around 2300 BC (or according to another interpretation around 1800 BC).

(1) Position of stress. The U/FU protolanguage had word i n i t i a l stress (Itkonen 1962), while the stress of the IE protolanguage was "f r e e" in the sense that the main stress could fall in different words and word forms on different syllables (Haugen 1976 : 103; König 1978 : 45); e.g. *pət'ēr* 'father' (stress on the 2nd syllable) and *bhr'āther* 'brother' and *dh'ukter-* 'daughter' (stress on the 1st syllable). As the position of stress had to be learned separately for each word form, the task was too difficult for the native speakers of the U/FU protolanguage. The result was the same as today when a Finn or Estonian learns an IE language with more or less free stress: they often place the stress on the first syllable; for example, instead of the correct Swedish pronunciation *diskut'era intres'anta probl'em*, they are apt to pronounce *d'iskutera 'intresanta pr'oblem*. The result was what now to a Germanist is the Proto-Germanic *Akzentverschiebung* or *Akzentwandel*.

The initial stress of the U/FU protolanguage and (after the *Akzentverschiebung*) also of the Germanic protolanguage is reflected in many fields of the daughter languages of the two protolanguages. So, for example, the Finnic and Germanic folk poetries have a l l i t e r a t i o n; cf. Finnish ***M**ieleni **m**inun tekevi, **a**ivoni **a**jattelevi* and German *Her fur**l**aet in **l**ante **l**uttila sitten, prut in **b**ure **b**arn unwahsan*. And both language groups make use of alliterate two-word idioms like Finnish ***m**aita ja **m**antuja*, German ***M**ann und **M**aus*, and English ***p**art and **p**arcel* (Stedje 1989 : 46).

(2) Quality of stress. The change in the quality of stress that took place in Proto-Germanic can be viewed as a process of "expiratization" which depends on the fact that the phonetic parameters of stress were different in the U/FU and IE protolanguages. It may sound absurd to state anything about the phonetic parameters of stress in two languages that were spoken thousands of years ago; the speech produced by the ancient speakers does not exist any more to be analysed in a phonetic laboratory and no listening tests can be arranged with systematically controlled phonetic parameters to find out what the mutual significance of, for example, intensity and fundamental frequency was in the sensation of stress by the two linguistic groups. Fortunately there is, however, some indirect evidence: I do not think anybody can seriously doubt the fact that the role of tone (in more physical terms fundamental frequency) was more relevant in the IE than U/FU protolanguage. It has been commonly maintained that the IE protolanguage used tone as a device for separating utterances otherwise identical in their phonetic shapes. Whether there really was a phonological tone or whether it was predictable (and therefore only allophonic) need not concern us here; it remains a fact that tone had a greater role in the IE than U/FU protolanguage. One essential outcome of the difference, no doubt, is that there are still today several tone languages among the daughter languages of the IE protolanguage but none in those based on the U/FU protolanguage (for the stød of Livonian often maintained to be a tone, see Wiik 1989b). In simplified terms, we may imagine that for the sensation of a stressed syllable, the native speakers of the IE protolanguage were accustomed to use, let us say, 5 "units" of fundamental frequency and 3 units of intensity (the remaining 2 units being of something else, such as duration, etc.), but the native speakers of the U/FU protolanguage usually used 3 units of fundamental frequency and 5 units of intensity to achieve the same perceptual result. The parameters of stress are features that native speakers are very little conscious of, and therefore it is very difficult in a language learning situation to get rid of one's own ways of signifying stress when speaking a foreign language. This difficulty was also evident in the U/FU > IE language shift. The native speakers of the U/FU protolanguage continued using their own parameters of stress also when speaking the IE language; more specifically, they pronounced the stressed syllables with "too strong intensity/air stream" and with "too small fundamental frequency difference". The same pronunciation mistake is typical of Finns and Estonians even today when they are learning to pronounce the stressed syllables of IE languages, which from their point of view sound much more "melodious" than the corresponding syllables in their own language. The result was that the stress in Proto-Germanic was based more on intensity and less on fundamental frequency than in the IE protolanguage; in articulatory terms it was now (if some simplification is allowed) based more on the strength of air stream and less on the manoeuvring of the vocal cords. The result was the "expiratization" of stress. This again meant that a larger portion of the air stream available for each foot (or phonological word) was used for the production of the stressed syllable and a smaller portion than before was left for the production of the unstressed syllables. The result was the centralization of stress: the stressed syllables became even more stressed and the unstressed syllables even more unstressed.

(2a) "Centralization" of stress. The centralized stress (*Akzentkonzentration*) can be verified in the IE and U/FU language material in the following way. The languages with centralized stress are often more restricted in their vowel systems than the languages with less centralized stress. The extreme case of a language with centralized stress is one in which only one vowel phoneme (the neutral vowel *ə*) can

occur in unstressed syllables. The reverse also often holds true: the more restricted the vowel system in a language is, the more centralized the stress of that language is. Even if this statement may not be true in one hundred percent of cases, it is a good candidate for a universal tendency. It is therefore likely that stress was more centralized in the U/FU protolanguages than in the IE protolanguage. In the U/FU protolanguage only a few vowels could occur in the unstressed syllables, whereas in the IE protolanguage practically any vowel, long, diphthongal or short, could occur in the unstressed syllables (Haugen 1976 : 103). The exact number of the unstressed vowels in the U/FU protolanguage varies within the range of 2—4. The number is three according to Itkonen (1961 : 63), and four according to Janhunen (1981) and Sammallahti (1988); the number is two if the front and back vowels of the Janhunen-Sammallahti system are interpreted as automatic variants depending on the frontness and backness of the entire word.

The centralization of stress was critical for the further development of the stressed and unstressed vowel systems of Proto-Germanic and its sister languages. The stressed vowel system became more diversified (i.e. the number of phonemes increased) and the system of the unstressed vowels was simplified (i.e. the number of phonemes decreased and became three during the first millennium AD). A strong tendency arose for apocope and syncope (deletion of unstressed vowels) as well as the monophthongization of diphthongs and shortening of long vowels in unstressed syllables. (Apocope, syncope, and the shortening of unstressed long vowels are often presented as a uniform phenomenon of "a dropping of one mora" in unstressed vowels.) The simplifications and deletions of the unstressed vowels in turn had a strong impact on suffixes: their significance diminished, and new ways of expressing grammatical and semantic relations arose; often separate words like pronouns and articles were favoured instead of suffixes; for example, OHG *hilfu* 'I help' became *ich hilfe* in MHG and the OHG Genitive Plural *hanōno* 'of the hens' became *der hanen* in MHG. Proto-Germanic and its daughter languages started their development from an synthetic language into an analytic one. All this was caused, if the contentions above hold true, by the incomplete learning of the IE word stress by the native speakers of the U/FU protolanguage. (In this article I do not deal with questions pertaining to the "foot isochrony" of (Pre-)Finnic, which is seen as the different behaviour of short and long syllables in some Germanic languages, particularly during the first millennium AD. For example, the unstressed vowels are deleted after a long stressed syllable more readily and in an earlier phase than after a short stressed syllable.)

It may seem odd that the IE protolanguage under the influence of the U/FU protolanguage started developing from a language with more or less even (non-centralized) stress contours to a language with centralized stress, and, more generally, from an synthetic to a more analytic language type. Can a typically synthetic language like the U/FU protolanguage with more or less even stress contours really cause this type of development in the IE language? The answer is: yes it can. It is a well-known fact in the theory of foreign language learning and language shift that the resultant change in the target language does not always need to be one that is directly borrowed from the native/first language; the result is often something that does not occur in either language. The IE > U/FU language shift represents a very typical example of this. As seen above, the "surprising" result in this case results from the difference in the parameters of stress. It is an outcome of the following more general principle. When the speakers of a non-tonal language learn a tonal language, they tend to use non-tonal features as the parameters of

stress in the target language. As a matter of fact, the principle is very simple when expressed in these general terms.

(3) Foot isochrony. In all the present Finnic languages, as well as at least in some Lappic dialects (Korhonen 1981 : 354—355), the unstressed vowels following a short first syllable are longer than those following a long first syllable; in all Finnish dialects, for example, the second syllable *a* is longer in *muta* than in *muuta, mutta,* and *musta,* and in all the Estonian dialects the *a* is longer in *jama* and *lina* than in *jaamad, jaama,* and *linnad, linna.* It is likely that this type of foot isochrony that is manifested as an inverse proportunality of the second syllable vowel and the first syllable is of at least Pre-Finnic origin.

The fact that Germanic unstressed *i* and *u* often disappeared in West and North Germanic when following a long first syllable but stayed there when following a short first syllable is a clear manifestation of "foot isochrony" in these Germanic dialects; the "seeds" of the phenomenon may have existed in Proto-Germanic, as well. Good examples of the "Pre-Finnic type of foot isochorony" in West Germanic is offered by the words for 'son' and 'hand': *sunus* and *handus* in Gothic, but *sunu* and *hant* in Old High German (König 1978 : 53).

(4) Grimm's Law. By Grimm's Law is meant a series of changes that concerned the IE plosives (see, for example, König 1978 : 44—45):

(a) the unvoiced (aspirated/unaspirated) plosives became corresponding unvoiced fricatives:

$p/ph > f$, $t/th > þ$, $k/kh > \chi$

(b) the voiced aspirated plosives became corresponding voiced fricatives (which later, in many cases, developed into the corresponding voiced plosives *b, d, g*):

$bh > \beta$, $dh > ð$, $gh > \gamma$

(c) the voiced unaspirated plosives became corresponding voiceless unaspirated plosives:

$b > p$, $d > t$, $g > k$

It is likely that the outcome of the change $p/ph > f$ was not originally the labio-dental *f* but the bilabial φ. As, however, the labio-dental fricative is universally less marked than the bilabial one, the additional change of $\varphi > f$ took place.

To see that these changes may really be of U/FU origin, a comparison of the plosive systems of the IE and U/FU protolanguages is needed. Traditionally the plosive systems are the following. (Here I consider only three, not four places of articulation in the IE system, and only nonpalatalized plosives in the U/FU system, because the respective questions of the places of articulation and palatalization are treated separately below.)

IE protolanguage:

ph	*th*	*kh*
p	*t*	*k*
b	*d*	*g*
bh	*dh*	*gh*

U/FU protolanguage:

p	*t*	*k*

The *d* often included in the U/FU plosive system is here interpreted to be the fricative δ (according to Sammallahti 1988 : 482 "The phonemes /*d*/ and /*d'*/ were probably spirants").

The plosive systems of the two languages were quite different. The number of plosives was much higher in the IE protolanguage, and also the inventory of distinctive features was more diversified in the IE protolanguage. The distinctive fea-

tures that occured in the IE but not in the U/FU protolanguage were aspiration and voice. It is therefore likely that the oppositions of aspirated and unaspirated plosives as well as those between voiced and voiceless plosives caused learning difficulties for the U/FU learners. I will first deal with the aspiration difficulty and then with the voice difficulty.

(4a) Aspiration is generally interpreted as an *h*-like friction produced by the narrow passage in the vocal cords during a few centiseconds after the explosion of the plosive. In the traditional sense the aspiration is "a suspended start of the periodical vibration of the vocal cords after the explosion of the plosive". The aspiration is often symbolized with an *h* following the symbol of the plosive: *ph, th, kh, bh, dh, gh*. The aspiration of the plosives in the IE protolanguage was not, however, of this laryngeal type. It was (as shown, for example, by the identifications made by the speakers of the U/FU protolanguage) produced at the place of the articulation of the plosive, much in the same way as affricates are. To put it briefly, the "aspiration" was not an "aspiration proper" but what is often called "frication" by phoneticians (Fant 1960). This term refers to the slow opening of the closure of the plosive so that there is a narrow enough passage at the place of articulation of the plosive to produce a fricative sound. The frication does not sound *h*-like; it sounds like the fricative produced at the place of articulation of the plosive in question: after bilabial plosives it sounds like *f*/*φ* and, after dentals like *þ* and *ð* (or *s* and *z*) and after velars like *χ*/*h* and *γ*. Of the aspirated plosives the U/FU speakers heard only the frication; they did not hear the occlusion. The identification processes were, therefore, as follows.

Pronounced by an IE speaker:			Identified by a U/FU listener:		
pf	*tþ*	*kχ*	*f*	*ϑ*	*χ*
bβ	*dð*	*gγ*	*β*	*ð*	*γ*

These identification mistakes resulted in that part of Grimm's Law that concerns the "aspirated" plosives: They became the corresponding fricatives in Proto-Germanic. (Here the IE unaspirated plosives *p, t, k* are treated as if even they were aspirated. It is probable that they, too, were pronounced energetically and the U/FU speakers did not hear the difference between the aspirated and unspirated voiceless plosives.) Another departure from the traditional way of thinking (in addition to treating the "aspiration" as a frication) is that in the above treatment the "aspiration" is considered voiced in connection with the voiced aspirated plosives (not unvoiced as is traditionally often done). The "voicing" here, no doubt, refers to a creaky or murmured voice quality and a low fundamental frequency. (The fundamental frequency of the unvoiced aspirated plosives is relatively high at the beginning phase of the following voiced sound, whereas in the voiced aspirated plosives the fundamental frequency is relatively low; the fundamental frequency difference thus making one of the essential cues between voiceless and voiced plosives. In the neutral plosives, the fundamental frequency is neutral.)

The following word forms are examples of the "aspiration part" of Grimm's Law (Krahe 1960 : 81—83, 90—91). In the forms in parentheses the "aspiration" is symbolized in the way suggested above to show that (according this solution) this part of Grimm's Law is simply an "omission of the occlusion" of the plosive.

IE	***por-**	(***pf**or-*)	OHG	***f**aran*
IE	***ph**oino-*	(***pf**oino-*)	OHG	***f**eim*
IE	***tū***	(***tþ**ū*)	Gothic	***þ**ū*
IE	***trékhō***	(***tþ**rékhō*)	Gothic	***þ**ragjan*
IE	***kap-**	(***kh**ap*)	OHG	***h**effen*

Latin	*ne**b**ula*	(IE *-**bβ**-*)	Old Saxon	*ne**β**al*
IE	**me**dh**jos*	(*me**dð**jos*)	Old Norse	*mi**ð**r*
IE	**stei**gh**-*	(*stei**gγ**-*)	Anglo-Saxon	*stī**γ**an*

When the "aspiration part" of Grimm's Law is treated as a mistake that resulted in only the "aspiration" of the aspirated plosives remaining and the plosive (more precisely the occlusion) disappearing, it is worth noting that a very similar sound change took place again much later when the affricates resulting from the "second sound change" (*die zweite/hochdeutsche Lautverschiebung*) of High German around 500—700 AD were simplified into the correspomding fricatives; cf. Dutch *schi**p*** — German *Schi**ff***, English *tha**t*** — German *da**ss***, and Swedish *sa**k*** — German *Sa**che***: the "aspiration" (more precisely the "affrication") of the plosives (more precisely that of the affricates) remained and the plosive disappeared. This simplification, too, was based, at least partly, on a foreign influence. The phenomenon started in southern Germany and was probably based on Celtic influence; it certainly was not of U/FU origin. Nevertheless, it is of interest here because it provides evidence for the fact that sound changes often repeat themselves in the history of languages.

In many cases, the voiced fricatives resulting from the IE aspirated voiced plosives developed later into voiced plosives. This was common in the areas that later became Old High German (König 1978 : 44). In these areas the developments were: $b\beta > \beta > b$, $d\eth > \eth > d$, and $g\gamma > \gamma > g$.

The unvoiced plosives did not, however, develop into corresponding fricatives, but remained plosives if immediately preceded by *s*, *p*, *t*, or ***k***; e.g. Latin *mi**sc**ēre* — OHG *mi**sk**an* and Latin *oc**t**ō* — OHG *a**ht**o*. This "exception" to Grimm's Law is a natural consequence of the more or less universal tendency for plosives not having an aspiration/frication when preceded by another voiceless obstruent (cf. for example, modern English where there is no aspiration in the voiceless plosives after *s* or another plosive as in *s**p**y*, *s**t**ay*, *s**k**y*, and *ac**t**or*). Grimm's Law did not operate in these cases (the IE plosives were not identified as the corresponding frications by the speakers of the U/FU protolanguage) because there was no frication in these plosives. The "exceptional" behaviour of the plosives after another voiceless obstruent is therefore a natural consequence of the phonetic quality of these plosives.

(4b) Voice. The devoicing part ($b > p$, $d > t$, $g > k$) of Grimm's Law can also be considered a U/FU substratum. As there was no voice opposition in the U/FU protolanguage in the plosives, the voiced plosives were identified as the plain or normal plosives *p*, *t*, and ***k***. The same has happened ever since when the speakers of the Finnic languages have identified IE voiced plosives. Even today Finns and Estonians are apt to identify the *b*, *d* and *g* of the IE languages as *p*, *t* and ***k*** (e.g. *barbarian* and *banana* are often heard and pronounced as *parpaari* and *panaani* by Finns).

The following word forms represent examples of the devoicing part of Grimm's Law (Krahe 1960 : 91—92):

Greek	***b**ait*	Gothic	***p**aida*	Latin	*la**b**ium*	Swedish	*lä**pp***
IE	**d**e**m-*	Gothic	***t**imrjan*	Latin	***k**ardia*	English	***h**eart*
IE	**au**g**-*	Gothic	*au**k**an*	Latin	***g**enu*	Swedish	***k**nä*

To summarize, Grimm's law in its entirety (the "aspiration part" and "devoicing part") can be interpreted as learning mistakes made by the speakers of the U/FU protolanguage learning the IE protolanguage. It is worth noting that no "pushing" or "pulling" affects are needed to show that one series of changes (for example, the devoicing of *b*, *d*, *g*) caused another series of changes (the original *p*, *t*, ***k*** becoming fricatives). Grimm's Law in its entirety can be directly considered a U/FU substratum without any "pushing" or "pulling" effects of the various series of plosives.

(5) Verner's Law is "an exception to Grimm's law" ("*Eine Ausnahme der ersten Lautverschiebung*"). According to Verner's Law, the voiceless obstruents (plosives and *s*) became voiced (they did not remain voiceless as presupposed by Grimm's Law) when occuring in a voiced surrounding immediately after an unstressed syllable; e.g. *pət'ēr* >> *f'aðēr*. My explanation for Verner's Law (or, in fact, part of it as explained below) is as follows. In connection with the stress shifting to the first syllable of a word, two operations were needed. The word initial syllables had to be physically strengthened and the word medial syllables physically weakened in order to have the p e r c e i v e d stress shifted to the first syllable. The latter process (sufficient weakening of word medial syllables) was difficult if the syllable began with a voiceless and therefore intrinsically relatively long obstruent. There seem to be two universal tendencies operating here: (a) phonetically long syllables with high fundamental frequency (rather than short syllables with low fundamental frequency) tend to be identified as stressed and (b) voiceless obstruents tend to be longer in duration (than their voiced counterparts) and they tend to raise the fundamental frequency of the immediately following vowel. When both of the factors mentioned in (a) were present in a word medial syllable, it was "too difficult" for a listener to identify the syllable as non-primary stressed, and that syllable had to be weakened by an extra measure: the v o i c e l e s s o b s t r u e n t had to be made v o i c e d. This operation made the syllable shorter and simultaneously lowed its fundamental frequency, and, therefore, it was easier to perceive the syllable according the general rule of initial stress. (From the articulatory point of view, the corresponding phenomenon was the diminishing of the total articulatory energy used for the production of the syllable because voiced plosives are usually shorter and less "energetic" than the voiceless ones). All the features caused by the voicing of the plosive weakened the features usually contributing to the sensation of stress, and the syllable could more easily be perceived as unstressed, or at least non-primary stressed.

The voicing of the obstruent of those word medial syllables that were sensed as "too heavy" (case 1 below) for being perceived as non-primary is, however, only one part of Verner's Law. The other part consists of the pronunciation of all the u n s t r e s s e d s y l l a b l e s w e a k. A weak pronunciation means here among other things that the voiceless obstruents are pronounced as voiced. This part of Verner's Law is simply another reflection of centralized stress. Not only is the quality of the vowels made more *ə*-like and more susceptible to assimilation in the unstressed syllables; the same holds for the obstruents: they tend to be more loosely articulated and they also tend to be assimilated more strongly by their voiced environment and become voiced.

Verner's Law is now seen to consist of t w o p a r t s, as the voiceless obstruents are made voiced in two environments: (a) at the beginning of a "too heavy" syllable and (b) between two unstressed syllables. The two parts have quite different motivations, but they can, of course, be combined (as traditionally done by Indo-Europeanists) by stating that the obstruents became voiced when preceded by an unstressed syllable.

There are four theoretically possible sequences of strong and weak syllables:

1	2	3	4
cv.CV	cv.cv	CV.cv	CV.CV

Verner's Law makes the voiceless obstruents voiced in cases 1 and 2 but not in cases 3 and 4. It is seen that the two ways (the traditional one and the one suggested here) of defining the environments of Verner's Law are identical: (a) the tra-

ditional way of stating that the law operates "immediately after an unstressed (weak) syllable" and (b) the one suggested here stating that it operates "at the beginning of a strong syllable following a weak syllable and between two weak syllables". Both definitions end up with the result that Verner's Law operates in cases 1 and 2 but not in cases 3 and 4.

The two parts of Verner's Law are exemplified by the IE sentence **pət'ēr bh'ēreti* 'father bears' in which the first word includes an example of a voiceless obstruent at the beginning of a strong syllable following a weak syllable and the second word an example of a voiceless obstruent in a sequence of two unstressed syllables. It is worth noting that two very similar types of weakening of the unvoiced obstruents also occur in Finnic Consonant Gradation, as exemplified by a Proto-Finnic expression like **äitin puurota* > **äiδin puuroδa* 'mother's porridge', in which the *t* in the first word is weakened because it occurs at the beginning of a "too strong" syllable (a syllable difficult to identify as unstressed because of its closeness and an initial voiceless plosive), and in the second word because it occurs in a sequence of two weak (unstressed) syllables. In Finnic, the former type of Consonant Gradation is called "radical" (as it often concerns the stems of words) and the latter "suffixal" (as it often concerns suffixes).

As one part of Verner's Law (the *pət'ēr* type) is connected with the shift of stress to the first syllable and the other (the *bh'ēreti* type) with centralized stress and the weak pronunciation of unstressed syllables, and both being of U/FU origin, Verner's Law in its entirety is a U/FU substratal phenomenon.

It is worth noting that the solution to Verner's Law presented here does not presuppose that the shift of stress to the first syllable took place first and Verner's Law later, as it is traditionally often thought. Instead, the stressed shift is achieved by a preceding "silent" application of Verner's Law. (The "silent" application of Verner's Law means a "forward looking rule" during which the result of another rule (shift of stress) is first foreseen, and if the result is not satisfactory, an extra measure (Verner's Law) is taken. In this sense Verner's Law is an anticipatory measure taken for achieving favourable results for the stress shift; if it is not taken, the stress cannot be perceived to shift to the first syllable.) Neither does the substratum solution presented here for Grimm's and Verner's Laws presuppose any particular mutual order for the two: the results are the same regardless of the order of application of Grimm's and Verner's Laws. As the outcomes of neither law are identical with the inputs of the other, one of the laws does not feed the other; instead their mutual order is free. In reality, the two laws perhaps operated simultaneous in the situation in which the native speakers the U/FU protolanguage learned the IE protolanguage.

The relationship between Verner's Law in Proto-Germanic and Consonant Gradation in the Finnic languages can now be seen as a "back-and-forth movement": Verner's Law was originally a U/FU substratum feature based on initial stress, and Consonant Gradation is a Germanic and Scandinavian feature brought to the Finnic coasts by the Germanic and Scandinavian newcomers (for the Germanic origins of Finnic Consonant Gradation, see Posti 1953—1954). Lauri Posti's conclusion that the Consonant Gradation of the Finnic languages is of Germanic origin is, no doubt, correct, but he did not have the opportunity of going deep enough in history to see that Verner's Law in its turn was of U/FU origin.

(6) Places of articulation. The plosives of the IE protolanguage had four (according to some sources even five) places of pronunciation, while the U/FU protolanguage had only three. The difference was reflected as an under-differentiation of the palatal and velar/labio-velar places of articulation by the U/FU speakers; they did not hear the difference between the palatal and velar/labio-velar plosives, and they were not able to hear "two *k*'s" or "two *g*'s" (one palatal, the other velar/

labio-velar) like the speakers of the IE protolanguage; e.g. IE ***kap-*** 'to take' and IE ***q*^{u}*od*** 'what'. (In Strade 1995 the same substratum influence is given and the resulting Proto-Germanic sound change is expressed as the "palatal guttural stops merging with the homorganeous velars"). It is likely that the U/FU system in this respect was similar to the present one in, for example, Finnish and Estonian, where the ***k*** and *g* have two places of articulation (one palatal, the other velar), but the two places are automatically determined by the frontness vs. backness of the neighbouring vowels. If this really was the case, the learning difficulty of the U/FU speakers learning the IE protolanguage was to learn to split their one phoneme into two. This is one of the most difficult learning problems met by foreign language learners. It is therefore natural that in the IE speech of the U/FU speakers (in other words in Proto-Germanic) only three places for the plosives occurred.

(7) Palatalization. By the palatalization of consonants is here meant the over-differentiation on the part of the U/FU speakers when hearing and producing consonants followed by *i/j*. In the U/FU protolanguage there was the opposition of palatalization in many consonants, whereas in the IE protolanguage there was no equivalent opposition. The result was that the native speakers of the U/FU protolanguage heard the lightly palatalized consonants that occured before *i/j* in the IE protolanguage as palatalized. The same happens today, for example, when Russians (who have palatalization as a distinctive feature in their own language) hear palatalized consonants in Standard Finnish (where only slight allophonic but no phonological palatalization exists); so, for example, Russians may hear all the consonants as palatalized (soft) in a Finnish word like *hyllyllä* (phonetically *hüllüllä*) and all the consonants unpalatalized (hard) in a word like *hullulla*. I assume that in the initial phases of Proto-German there was phonological palatalization of consonants, but later this was turned into what is generally called Umlaut in the following way. Quite often the palatalization of consonants is manifested as a palatal transition of the neighbouring vowels; so, for example, the theoretical word */lat'/* may phonetically be realized as *laet'* or *lait'* (if the palatal transition comprises only part of the preceding vowel) or even *lät'* (if the palatal transition comprises the whole vowel). Accordingly, the palatalized consonants had a palatal transition in the preceding vowel, and the transition began to comprise the whole vowel turning a back vowel into a front one. This did not happen in the Proto-Germanic phase, but only later in the Northern and Western dialects (but not in the eastern or Gothic dialect). The phenomenon became phonemic during the latter half of the first millennium AD. The seed for the phenomenon was there, however, from the first beginning of the development of Proto-Germanic (cf. also the monophthongization *ei* > *ii* and the vowel change *e* > *i* dealt with below).

It is possible that the U/FU v o w e l h a r m o n y, too, contributed to the emergence of Umlaut in the Germanic languages. In the phase when the U/FU protolanguage still had two different *i*'s, one front and the other back (Janhunen 1981), vowel harmony was "complete" in the sense that there were no neutral vowels. The harmony pairs were *i* — *į*, *ü* — *u*, *e* — *o*, and *ä* — *a*. For example, the Scandinavian forms like ***katilaR***, ***komiR***, and ***ungiRa***, went against vowel harmony, and the U/FU speakers were not able to pronounce the vowels correctly. They made the words obey vowel harmony by pronouncing the words as ***kętilR/kätilR***, ***kömiR/kömR*** and ***üngiRa/üngRe*** (Haugen 1976 : 153). I will not go further into the problem of how much of the rise of Umlaut should be attributed to the palatalized consonants and how much to vowel harmony. I only state that both of these are potential sources of Umlaut and they both are based on a U/FU substratum. Germanic Umlaut is, therefore, another instance of a U/FU substratum.

When there is the opposition between palatalized and non-palatalized consonants in a language, the opposition is often made more conspicuous by at least slightly "hardening" the non-palatalized members in two alternative ways, either by l a b i o - v e l a r i z i n g or p h a r y n g a l i z i n g them. Labio-velarizing means here a *u*-like quality (low F1 and low F2) and pharyngalization an *a*-like quality (high F1 and low F2) in the consonant. As the seed for palatalization (low F1 and high H2) before *i/j* already existed in Proto-Germanic, there also very likely existed the seed for labio-velarization and pharyngalization in the consonants preceding, respectively, the *u*-like and *a*-like vowels. All this means that in sequnces like *a*C*i*, *e*C*u*, and *e*C*a*, the C's were *i*-like, *u*-like, and *a*-like, respectively. The secondary articulation of the C's was manifested (as these kinds of phenomena often are) in the transitions of the vowel preceding the C. Analogically to the vowels preceding a palatalized consonant, the labio-velarized and pharyngalized consonants affected the preceding vowel in two possible ways: either only the latter part of the vowel was affected, or the entire vowel was changed. The former case means that the vowel was diphthongized in such a way that its final part became more *u*-like or *a*-like. This phenomenon is called "breaking", and it emerged, for example, in Proto-Scandinavian as late as the latter half of the first millennium AD; so, for example, the first vowel in the IE word **egō* 'I' got first an *a*-like final transition (> *eag-*) and was then changed to *iag* and *jag*. Equivalent diphthongizations took place also in Old High German; cf. Gothic *hēr* — OHG *hear/hiar/hier* 'here' and Gothic *brōþar* — OHG *bruoder* 'brother'. (A very similar development also took place on the other side of the Baltic Sea in Latvian and Livonian (Posti 1946—1948), and it is possible that the breaking in Finnish and related languages, i.e. the diphthongization of the long mid vowels *ee, öö, oo* > *ie, yö, uo* as well as the lowering of the second member in these diphthongs, is also based on the same cause.) If the labio-velarized and pharyngalized consonants affected the entire preceding vowel, the result was *u* - h a r m o n y and *a* - h a r m o n y, respectively. This phenomenon also emerged in Proto-Scandinavian during the latter half of the first millennium AD, but its beginning very likely existed already in Proto-Germanic; e.g. Scandinavian *barnu* > *bǫrn* 'children' and *hurna* > *horna* 'horn' (Haugen 1976 : 153).

(8) The syllabic resonants of the IE protolanguage were dissoluted into sequences of *u* plus the resonant in question; e.g. IE **km̥tòm* — Gothic ***hund*** 'hundred', IE **bhṛtis* — OHG *gi-**burt***. The phenomenon can be seen as a result of the substratal influence from a language that did not have syllabic resonants (but of course, the change can also be easily explained as an intralingual process, the syllabic consonants being universally a rather heavily marked category). One, but of course not the only candidate for such a substratal language is the U/FU protolanguage.

Before going to the Proto-Germanic v o w e l c h a n g e s an overall inventory of the vowel systems of the protolanguages in question is in order:

IE:

Short vowels			**Long vowels**		
i		*u*	*ī*		*ū*
e	*ə* *o*		*ē*	*ō*	
	a			*ā*	

U/FU:

Short vowels				**Long/double vowels**	
i	*ü*	*į*	*u*	*ii*	*uu*
e			*o*	*ee*	*oo*
	ä	*a*			

(9) *ə* > *a* **and** *o* > *a*. In Proto-Germanic, the short vowels *ə*, *o*, and *a* merged into *a*. The mergers are traditionally presented as two sound changes: *ə* > *a* and *o* > *a*; cf. IE **pət'ēr* — OHG ***fa**ter* and IE ***por***- — OHG ***fa**ran* 'to go'. The merger of *ə* into *a* is probably a result of under-differentiation based on the fact that there was no vowel quality corresponding to the "schwa indogermanicum" in the U/FU protolanguage, and the closest U/FU equivalent for the IE *ə* was *a*.

The latter merger is based on the fact that the short low back vowel of the U/FU system was labial; there was no "ordinary" illabial *a* (as in the IE protolanguage), but a labial *å* instead (Janhunen 1981). The qualities of the back vowels of the U/FU speakers when speaking the IE language were, accordingly, *u* and *å*. Later, the phoneme area of Germanic *u* expanded as a new *o*-like allophone emerged as a result of *a*-umlaut (e.g. *wulfa* > *wolfa*), and the system of the back vowels began to involve three degrees of openness again. The emergence of an extra back vowel caused the need for the open vowel *å* to become more different from the new mid vowel *o*; the result was that *å* lost its labiality and became *a*.

The two vowel changes *oi* > *ai* and *ou* > *au* involving the Proto-Germanic diphthongs are often presented as more or less independent changes (e.g. Krahe 1960 : 52—54); e.g. IE ***oi**nos* ≫ Gothic ***ai**ns* and IE **ro**udhos ≫ Gothic ***rau**þs*. It goes without saying, however, that these are just two instances of the general change *o* > *a*.

(10) *ā* > *ō*. The U/FU system of long vowels included only the four phonemes *ī*, *ū*, *ē*, *ō*. (The alternative solution is to interpret these as sequences of two identical vowels: *ii*, *uu*, *ee*, and *oo*.) There were no low long vowels in the U/FU protolanguage. The IE system had five long vowels, one of which (*ā*) was low. The result was that the *ā* pronounced by the IE speakers was identified and also pronounced as *ō* or *oo* by the U/FU speakers. In this case the insufficient differentiation on the part of the U/FU speakers resulted in the Proto-Germanic sound change *ā* > *ō*; e.g. IE **māter* ≫ PSc *mōder* 'mother'.

Another way of explaining the change of IE *ā* to *ō* is the following: Under the U/FU influence, the IE back vowel system of three degrees of openness developed analogously in the short and long series in that in both the first reflection was an *å*-like quality. Later, the *å*-like quality developed into an *o*-like quality in the long series because of the emergence of a new *a*-like vowel as a result of the sound change $\bar{e}^1 > \bar{a}$ (e.g. $\bar{e}^1$*tum* > *ātum*). Accordingly, in the short series, the quality of *å* became *a* because of the emergence of a new *o* phoneme, while in the long series, the quality of *å* became *o* because of the emergence of a new *a* phoneme. Even if the sound changes *u* > *o* and $\bar{e}^1 > a$ did not yet take place (as phonological changes) in Proto-Germanic they may have existed in the language quite early as mere allophonic variations.

The fact that the phonetic outcome of the merger of the *o*-like and *a*-like vowels *a*-like vowel in the short series and an *o*-like vowel in the long series, is manifested by many old Germanic loan words in the Finnic languages (borrowed from the Proto-Germanic and Proto-Scandinavian newcomers to the northern and eastern coasts of the Baltic Sea); cf. PG *χalljon* — Finnish *kallio* and PG *wokra*(*z*) — Finnish *vuokra* (earlier *vookra*) (Wiik 1989a : 22—23).

It is worth noting that a merger of *o*, *a* and *ō*, *ā* also took place in the Baltic and Slavic protolanguages (which probably also are based, partly at least, on a U/FU substratum), but in no other daughter language of the IE protolanguage (Krahe 1960 : 50—56). Perhaps the following generalization can be made: the two back vowels *o* and *a* merged in all those daughter languages of the (northern) IE protolanguage that emerged under the substratal influence of the U/FU protolanguage.

(11) ***ei* > *ī*.** The monophthongization of *ei* to *ī* is a sound change that can be considered the first step in the development of the palatalization and Umlaut dealt with above. First *i/j* affected only those immediately preceding sounds that were phonetically closest to *i/j*. (This principle is a reflection of the universal tendency according to which the palatalization of consonants often concerns the dental, but not, for example, the labial and laryngeal consonants.) Accordingly, only the phonetically closest sound *e* was first affected by the *i/j*, in other words, the palatalization process began with the change of *ei* to *ī* (or *ii*); e.g IE **steigh-* ≫ OHG *stīgan* 'to stride'. And in addition, the change took place only when the *i/j* occured immediately after the *e*; i.e. the assimilation started as an intance of contact assimilation and was only later developed into an instance of distant assimilation (cf. the vowel change *e* > *i* dealt with next).

(12) ***e* > *i*.** The change of *e* to *i* took place in Proto-Germanic if there was an *i* in the immediately following syllable; e.g. IE **esti* ≫ OHG *ist*. (The same change also took place when the immediately following syllable had a *u* or when the syllable in question ended in a consonant cluster beginning with a nasal, but these instances need not concern us here.) This development is another step (after the first step of *ei* > *ī*) in the palatalization and Umlaut processes in Proto-Germanic dealt with above. The ultimate cause of the development is the palatalization of consonants of the U/FU protolanguage as presented above.

(13) Apocope of *a* and *e*. Before the more general deletion of unstressed vowels during the first millennium AD, an early deletion of *a* and *e* took place in Proto-Germanic (Lehman 1961 : 70; Haugen 1976 : 103); e.g. *waita* > PG *wait* 'I know' and *waite* > PG *wait* 'he knows'. This instance of vowel deletion represents, no doubt, an initial stage in the process of more general vowel deletion. It is another reflection of stress centralization and, therefore, basically (even if not directly) of U/FU origin. The question of interest here is: Why were *a* and *e* deleted but not the other two unstressed vowels *i* and *u*? It is a well known fact in some of the Finnic languages, for example, that the vowels first to be deleted are the high and intrinsically least sonorous ones (e.g. *i* and *u*), while the low vowels and intrinsically most sonorous ones (e.g. *a*) stay longest intact. In the Proto-Germanic case, therefore, the phenomenon seems to operate quite differently from the corresponding ones in some Finnic languages. This is another reflection of the difference in the suprasegmental types of the IE and U/FU protolanguages. As seen above, the IE protolanguage was more of the "tonal" type than the U/FU protolanguage and, therefore, the significance of the fundamental frequency was greater in the IE protolanguage. On the other hand, the fundamental frequency is intrinsically (and universally) high and the intensity low in high vowels, and the intensity is intrinsically low in high vowels and high in low vowels; in other words, *i* and *u* are musically high and "not loud", while *a* is musically low and "loud". When the unstressed vowels become even more unstressed, the change is seen as a lowing of the fundamental frequency in the "tonal type" languages and in the intensity in the other type. Therefore, it is the high vowels of the "tonal" languages and the low vowels of the "intensity" type languages whose fundamental frequency first goes "below the perceptual threshold" and the vowels become unheard or deleted.

Conclusion

I started this article by listing the thirteen Proto-Germanic sound changes that can be considered the principal causes for Proto-Germanic to split off from the rest of the IE languages. I then tried to show that a l l of these sound changes can be seen as having been caused by U/FU substrata.

Many Indo-Europeanists today seem to think that the splitting off of Proto-Germanic could not be an intralingual process (see, however, König 1978); there must have been a non-Indo-European language in the immediate vicinity of the original Proto-Germanic language area that has caused the specific Germanic developments. Often this language is considered to be an unknown l a n g u a g e X which practically nothing is known about. On the other hand, many present-day archaeologists have independently come to the conclusion that the U/FU language area was a vast periglacial or marginal zone reaching from the Atlantic to the Ural mountains and northwestern Siberia. It was my purpose in this article to give some linguistic (more precisely phonetic) evidence for the fact that no unknown language X is needed; t h e U/F U p r o t o l a n g u a g e will do.

At least, a l l t h e P r o t o - G e r m a n i c s o u n d c h a n g e s c a n b e g i v e n a m o t i v a t e d a n d n a t u r a l e x p l a n a t i o n i f s e e n a s U r a l i c / F i n n o - U g r i c s u b s t r a t a.

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КАЛЕВИ ВИИК (Турку)

УРАЛЬСКИЙ И ФИННО-УГОРСКИЙ ФОНЕТИЧЕСКИЙ СУБСТРАТ В ПРОТОГЕРМАНСКОМ ЯЗЫКЕ

Выделение протогерманского языка из индоевропейской языковой общности характеризуют многие фонетические изменения, следующие 13 изменений — наиболее важные из них: 1) сдвиг ударения на первый слог основы; 2) изменение характера ударения — тональное превратилось в динамичное; 3) изохрония стопы (стихотворной); 4) закон Гримма; 5) закон Вернера; 6) слияние палатальных и велярных смычных; 7) палатализация согласных в соседстве с *i/j*; 8) переход звонких слогообразующих согласных в *u* + соответствуюший согласный; 9) изменения гласных *ə* > *a* и *o*> *a*; 10) изменение гласного $\bar{a} > \bar{o}$; 11) монофтонгизация *ei* > *ī*; 12) изменение гласного *e* > *i*; 13) апокопа *a* и *e*.

Многие исследователи индоевропейских языков считали, что все эти изменения не поддаются объяснению с точки зрения внутриязыковых процессов, а обусловлены влиянием какого-то неизвестного языка. Автор излагает точку зрения, согласно которой этим изменениям можно дать вполне мотивированное и естественное объяснение, исходя из уральского / финно-угорского субстрата.