# FROM MOUTH TO HAND

DENNIS PHILPS

*Department of English (IRPALL/ELANG), University of Toulouse-Le Mirail, 5, allées Antonio-Machado, 31058 Toulouse cedex 9, France*

Within a semiogenetic theory of the emergence and evolution of the language sign, I claim that a structural-notional analysis of submorphemic data provided by certain reconstructed PIE roots and their reflexes, projected as far back as theories of the evolution of speech will permit by a principle of articulatory invariance, points to the existence of an unconscious neurophysiologically grounded strategy for 'naming' parts of the body. Specifically, it is claimed that the occlusive sounds produced by open-close movements of the mouth, which have been shown experimentally to be synchronized with open-close movements of the hand(s), may have functioned as 'core invariants'. Morphogenetically transformed into conventionalized language signs, these could have served to 'name' not only the mouth movements and articulators involved, but also the hand movements with which they appear to be coordinated, as well as the hand itself.

## 1. Linguistics and the evolution of language.

As linguistic theories become more refined, and as the scientific study of language evolution advances, so interpenetration of knowledge has increased, encouraging some linguists to attempt to bridge the gap between the two fields. Yet the very nature of Saussurian linguistics, based as it is on the principle of the arbitrariness of the sign and on the conventional status of the latter, means that, to quote Nichols, "[T]here is no hope of recovering information about language origins by tracing linguistic descent." (1998: 128). In the field of neurolinguistics however, Buoiano seems to want to bridge this gap when he suggests that "we need a device that can define the sign as non-arbitrary within the frame of a neurolinguistic theory in order to explain why neurocognition and language have phylogenetically developed using (also) arbitrary 'signs', since this would appear as an irreducible contradiction in itself." (2001).

Here, I take my cue from Gentilucci *et al*. (2001), who suggest, as a result of their experimental work, that hand gestures may have been transformed into articulatory gestures by means of multiple motor commands to hand and mouth. The authors also hypothesize that open-close hand and mouth movements are strictly synchronized by means of brain-mediated, somatotopically mapped circuits, since grasping an object with the hand appears to influence mouth opening, and vice-versa. They go on to speculate, following Armstrong *et al*. (1995), that speech has evolved from a communication system based on hand gestures, a stance echoed by Corballis (2003), who argues that human language emerged from manual gestures rather than from primate calls. The semiogenetic theory of the conditions of emergence and evolution of the language sign (henceforth SGT) sketched out in Philps (2000) suggests that if open-close hand gestures were indeed transformed into open-close articulatory gestures, then the latter could have served to *refer back to* these hand gestures deictically, and to *stand for* them symbolically by means of an unconscious, neurophysiologically grounded, cognitive body-naming strategy. The processes involved in this putative strategy appear to include self-reference (Philps 2000: 217), vocomimesis (Donald 2001: 291) and conceptual mapping (Lakoff 2003: 246).

## 2. The SGT and the concept of 'sublexical marker'.

The SGT, constrained empirically by a corpus compiled from Proto-Indo-European (PIE) and Indo-European languages, postulates that the language sign was originally configured vocomimetically during a period in the evolution of *H. sapiens* when the oral apparatus, originally used for purposes of nutrition, respiration and visuofacial communication, began to be employed additionally for articulatory purposes. One major assumption of this theory is that the initial conditions of a system largely determine its subsequent conditions, though not exclusively so. Moreover, whereas the linguistic sign is arbitrary by definition and by conception, the language sign is envisaged as having *become* arbitrary.

The theory developed initially from an analysis of those initial consonant clusters of English with recurrent form and 'meaning' called 'phonæsthemes' by Firth (1930: 50), e.g. *bl-*, *gr-*, *sl-*, and *sn-*, although these "frequently recurring sound-meaning pairings" (Bergen 2004: 290) were identified by grammarians as long ago as the 17th century (Wallis 1653). In view of the lack of any rigorous definition of phonæsthemes and of criteria for classifying words containing them, I applied a principle of submorphemic invariance to the heuristically set up semiological classes in which they are found, i.e. '*gr-* words', '*sn-* words', etc. This allows one to identify subsets of words attesting a given phonæstheme whose members display both semiological and notional invariance, e.g. nasality in the subset of '*sn-* words' that includes *sneeze*, *sniff* and *snore*, and prehension in the subset of '*gr-* words' that includes *grasp*, *grip* and *grope*. I call the word-initial cluster thus conceptualized a 'sublexical marker' (Philps 2003), defined as a submorphemic unit displaying semiological and notional invariance within the subset(s) of words of which it conditions the meaning(s). These markers are noted typographically between angled brackets (<sn->, <gr->, etc.).

A 'notion' is not to be equated with Saussure's *signifié*, since it is envisaged as a cognitive entity which may be defined as a bounded set of complex mental representations resulting from the mind's attempts to categorize experience, notably the formal, functional, and inter-relational properties of the latter. Seen in this light, notions (noted between slashes, e.g. /nasality/), may be analysed according to principled cognitive criteria into hierarchically organized, topologically constrained notional domains to which a metric may be applied.

Now there is structural evidence in PIE, notably root-final *-*r*-/*-*l*- alternation that does not correlate with a change in 'meaning', as in **gal*- 'to call, shout'/**gar*- 'to call, cry' and **ghel*- 'to call'/**gher*- 'to call out', that **g*-

/**gh*-, which occupy the $C_1$ slot in the canonical PIE root structure $C_1VC_2$-, function as 'core invariants' (<*g->/<*gh->), and *-*r*-/*-*l*-, consequentially, as variables ($C_2$). A 'core invariant' may be defined synchronically as the minimal invariant structural-notional unit in a given subset belonging to a pre-established class of words (e.g. **g*- in PIE '**g*- roots', or *gr*- in English '*gr*- words'). A diachronic definition must, however, account for the fact that this unit can be zero (e.g. in the Middle/Modern English 'phonosemantic doublet' *gnip* (obs.) / *ønip* 'to bite'). Moreover, one of the above roots (**gher*- 'to call out') furnishes English with the '*gr*- word' *greet* (< Germanic **grōtjan* < PIE **ghrēdh*- 'to call out'), while the '*gr*- word' *grope* may derive, via **ghreib*-, from (apparently unattested) **gher*- 'to grasp' (Mallory & Adams 1997: 564). Hence, in spite of the fact that *r*- forms part of the semiologically invariant segment *gr*- in English '*gr*- words', notably in that subset having meanings which refer to /prehension/ (*grab*, *grasp*, *grip*, etc.), it nevertheless appears to occupy the variable slot ($C_2$) in the class of PIE '**g*-/**gh*- roots' from which some '*gr*- words' are derived.

There is also empirical evidence that a notional relation exists between the subset of '*gr*- words' including *grip*, *grope*, etc., and certain members of the semiological class of '*gVr(-)* words', e.g. *gird* (v.) 'to surround, encircle; to bind (a horse) with a saddle-girth'. This relation, which may be expressed by the function {<g(V)r(-)>, /prehension/}, can be traced back to PIE, since the '*gr*- word' *grope* and the '*gVr(-)* word' *gird* may derive, via a base II and a base I extension respectively, from the same PIE root, namely **gher*- 'to grasp' (oldest form **ĝher*-, Rix *et al*. 2001: 177). Now there is in PIE a homonymic root **gher*- 'to call out', one reflex of which is, as mentioned above, the English '*gr*- word' *greet* (v.). The relation in question may be expressed by the function {<g(V)r(-)>, /orality/}, in which <g(V)r(-)> is one possible actualization of the complex sublexical marker <g(V)C(-)>, as attested by, e.g., *gan* (n., slang) 'the mouth', *gape* (v.) 'to open the mouth wide, to shout', *gob* (n., slang) 'the mouth', etc. (*The Oxford English Dictionary*, 2nd edition, 1989, henceforth *OED*). If one examines the different actualizations of <g(V)C(-)> in PIE, a fairly consistent pattern of homonymic relations emerges, since this marker appears to condition the meanings of a number of apparently or clearly distinct roots referring to various subdomains of the superordinate domains /orality/ and /manuality/:

a) /manuality/: /scratching/ [*scratch* (v.) 'To wound superficially by dragging the claws or finger-nails over the skin']: **gerbh*- 'to scratch', **gher*- 'to scrape, scratch' and **ghrebh*- 'to dig, bury, scratch', /rubbing/ [*rub* (v.) 'To subject (a surface or substance to the action of something (as the hand, a cloth, etc.) moving over it']: *$\hat{g}hreh_1i$- 'to rub' and *$ghreh_1u$- 'to rub, grind', an extension of **gher*- 'to scrape, scratch', and /grasping/ [*grasp* (v.) 'To make clutches with the hand']: **ĝher*- 'to grasp, enclose', **ghabh*- 'to give, take, seize' (> OInd. *gábhastin*- 'hand', cf. OInd. *hásta*- 'hand' < **ĝhós-to-s* < **ĝhés-r*- 'hand') and

**ghreib*- ‘to grip’. This marker occupies the $C_1$ slot in the original PIE root from which words for the ‘hand’ are derived, namely **ĝhes*- (Markey 1984);

b) /orality/: /calling/ [*call* (v.) ‘to shout, utter loudly, cry out, summon’]: **gal*- ‘to call, shout’, **gar*- ‘to call, cry’, **gerh₂*- ‘to cry hoarsely’, **ghel*- ‘to call’, **gher*- ‘to call out’, **ĝheu(h)*- ‘to call, invoke’, etc., /yawning/: **ĝheh₂i*- ‘to yawn, gape’, /swallowing/: *$g^w$*elh₁*- ‘to swallow’, *$g^w$*erh₃*- ‘to swallow’, and /biting/: **gh(e)n*- ‘to gnaw’, **ĝ(y)euhₓ*- ‘to chew, eat’. This marker occupies the $C_1$ slot in many roots whose derivatives denote mouth-related features in various IE languages, e.g. **ĝembh*- ‘tooth, nail’, **ĝep(h)*-/**ĝebh*- ‘jaw, mouth’, and the compound **ghel-unā* ‘jaw’ (Watkins 2000).

This analysis seems to confirm that the consonant occupying the $C_1$ slot in PIE roots, e.g. **g*- in **gal*-, **gh*- in **ghel*-, **ĝh*- in **ĝher*-, and *$g^w$- in *$g^w$*elh₁*-, functions as a core invariant, which may take the form of a voiced occlusive tectal (‘occlusive’ being “an older term for *plosive*”, Trask 1996: 246), whether aspirated (**gh*-), aspirated and palatalized (**ĝh*-), labialized (*$g^w$- ), or not (**g*-).

**3. From occlusive to occlusion.**

Analytical methods such as archaeological inference, lexico-cultural assessment and glottochronology tend to converge, in spite of their respective shortcomings, on a time-depth of some 6,000-8,000 years BP for the earliest form of PIE (Mallory & Adams 1997: 586). If one accepts this estimation on the one hand, and the possibility of reconstructing the sound-notion functions {<g->, /orality/} and {<g->, /manuality/} for PIE on the other, then one hypothesis that will require exploration is whether the depth to which this function can be reconstructed is an indication that it has always existed. Although no linguistic methodology permits us to do this, there does exist a theory known as articulatory phonology (Browman & Goldstein 1992), in which the basic units of phonological contrast are seen as *gestures*. Applied to the theory of articulatory invariance outlined here, it may help us, indirectly, to extend the above-mentioned time-depth quite substantially, since, even though this theory is formulated without specific reference to language evolution, it incorporates phonetic and kinetic parameters. Now according to McNeill (2005: 255-256), the emergence of a thought-language-hand link could have begun as long as five million years ago with the emergence of bipedalism in *Australopithicus*, and the selection of self-responsive mirror neurons some two million years ago with the advent of *H. habilis* and later *H. erectus*. McNeill further estimates that the whole process could have been completed around a hundred thousand years ago.

Assuming that the phonetic feature common to PIE **g*- in **gal*-, **gh*- in **ghel*-, **ĝh*- in **ĝher*-, and *$g^w$- in *$g^w$*elh₁*-, etc., i.e. [occlusive], implies that a constriction/release has occurred at some point along the vocal tract, I contend that the manner feature which characterizes the occlusive realization of the core invariant <g-> in **gal*-, etc., is the static equivalent in the place-manner classification system for consonants used in phonetics, of the dynamic, open-close gesture [occlusion] in the theory of articulatory phonology. Reanalysing occlusives as articulatory gestures of occlusion allows us to trace the invariant manner feature [occlusive] in its gestural guise as [occlusion] beyond PIE, as far back as theories of speech evolution such as MacNeilage's "Frame/Content Theory" will permit, without abandoning the guiding principle of invariance on which the SGT is based. According to MacNeilage, who bases his comments on empirical studies of early consonantal articulation and syllable-formation in infants' babbling, "[syllabic] frames may derive from cycles of mandibular oscillation present in humans from babbling onset, which are responsible for the open-close alternation." (1998: 499). By this view, human speech seen as a motor function emerged when the cyclical, open-close alternations characteristic of ingestive activities underwent a series of sequenced adaptations resulting in them being employed in content-modulated syllabic frames for purposes of visuofacial and phonatory communication.

Other scholars who have adopted a similar stance include Studdert-Kennedy & Goldstein, who suggest that the hominid protosyllable may have arisen from cyclical lowering and raising of the jaw for mastication, adding that "Such a protosyllable can be viewed as a gesture, that is, as constriction and release of one of the vocal organs, set in the context of an overall vocal tract posture and combined with phonatory action." (2003: 240). The authors also note that "a CV word can be produced by a single organ forming a constriction and release without any precise coordination of consonant and vowel gestures. By contrast, a CVC word requires precise inter-gestural coordination – either consonant gestures to vowel or consonant gestures to each other." (2003: 252). If the earliest languages only had *CV* syllable structure (Hurford 2003: 53), then the phonetic realizations of a marker such as <g-> would have been incorporated into a *CV* syllable. And significantly, Southern (1999: 152) suggests that fully linguistic *CVC* frames may have evolved from *CV* frames by consonantal augmentation at some early stage in the evolution of the protolanguage.

**4. Conceptual projection.**

In the SGT, the open-close sounds produced by contact between the back of the tongue and the soft palate (a constriction-release gesture), with vibration of the vocal folds during the compression stage and cyclical jaw lowering-raising, are hypothesized to function as 'core invariants' of self-referential, goal-orientated language signs. The latter would enable the speaker — and the hearer, by what Gallese (2004) terms "intentional attunement" —, to 'name' not only the oral movements, functions and articulators such as the jaws involved in the production of the sounds, but also, by conceptual projection, other symmetrical parts of the body such as the 'hands' that feature goal-orientated, open-close (or otherwise oscillatory) movements too, notably in the form of extension-flexion or abduction-adduction cycles, possibly accompanied by sonority (clicking, etc.).

Within Lakoff & Johnson's source-to-target mapping theory (2003: 252), this body-naming strategy may be seen as one of top-down intradomain conceptual projection. In the SGT, the mouth is taken to be the 'source domain' and the hands the 'target domain' of the projection on the assumption that the vocal organs and their anatomical environment can function not only self-referentially (Philps 2000: 230-231), but also as a structural template for denoting other parts of the body (Heine 1997: 134). This hypothesis implies that the process leading to the 'naming' of the open-close movements of the vocal organs, their different functions, and the organs themselves, is metonymically based, i.e. an open-close sound for the open-close movements and articulators involved. The process leading to the 'naming' of apparently synchronized open-close hand movements, and the hand itself, is however partly metonymic, i.e. an open-close sound for the open-close movement(s) of the hands (coupled with the movement for the effector in the case of the body part), and partly metaphorical, i.e. top-down projection of common topological properties, functions and relations such as protrusion, angularity, movement and prehension.

One PIE root with an initial, voiced occlusive tectal that furnishes reflexes attesting a process of mouth-to-hand projection, observable linguistically as polysemy, is **ghrendh-* 'to grind', derivatives of which possess both an 'oral' sense, e.g. in Mod. Eng. *grind* (v.): 'Denoting the action of teeth, or apparatus having the same function', and a 'manual' sense, e.g., in *to grind the coffee mill*: 'to imitate with the hand the action of grinding, by way of contempt' (*OED*). Two other PIE roots testify to a cognitive process of mouth-to-knee projection, observable linguistically as homonymy, namely **ĝenu-* 'jaw, chin' and **ĝenu-* 'knee' (> Mod. Eng. *knee*). Also implicated is the hypothetical base **g(e)n-* 'to compress into a ball', since it furnishes a subset of English '*kn-* words' other than *knee* with meanings referring to /articulated body parts/, e.g. *knop* (n., obs.) 'The rounded protuberance formed by the front of the knee or the elbow-joint', *knuckle* (n.) 'the end of a bone at a joint, which forms a more or less rounded protuberance when the joint is bent, as in the knee, elbow, and vertebral joints…', and *knead* (v.) 'to work and press into a mass (as if) with the hands'.

**5. Conclusions.**

If the hypothesis of a strict relation between speech control and hand control put forward by Gentilucci and co-workers is correct, then it is conceivable that voiced occlusive sounds produced by open-close movements of the mouth synchronized with open-close movements of the hand(s) could, once morphogenetically augmented by syllabification and differential consonantal accretion (e.g. *G-* > *GV-* > *GVC-*, as in PIE **g-* > **ga-* > **gal-*), have served to 'name' not only open-close mouth movements such as 'gnawing' and the articulators involved, but also coordinated hand movements such as 'grasping' and the effectors involved. The conventionalized signs thus formed would have meanings that, being of bodily origin, would be common to the entire speech community concerned. Once integrated into a linguistic system and subjected to its constraints, the 'body words' thus configured may have undergone desemanticization (or 'body bleaching') and grammaticalization. This is attested by English spatial grams such as *aback*, *abreast*, *afoot*, *a hand* (phr., obs.), *ahead*, *aknee* (obs.), etc., an indication that the invariant, topological relations which characterize the body, transposed into grammar via the lexicon, may provide a structural template for certain types of syntactic relations.

To sum up, the proposed body-naming strategy appears to be grounded in the brain's apparent capacity to dynamically and empathically simulate the cyclical, articular, goal-orientated, open-close movements of the hands by means of synchronized cyclical, articulatory, goal-orientated, open-close movements of the jaws. This hypothesis is accredited by recent research on the reciprocal influence between hand and mouth movements (e.g. Gentilucci *et al*. 2001), mirror neurons (e.g. Rizzolatti & Craighero 2004) and embodied simulation (e.g. Feldman & Narayanan 2004, Gallese & Lakoff 2005). Further exploration of the relevant language data, and a deeper understanding of the embodied processes of conceptual projection and simulation, may well set us on the road to attaining the neurolinguistic goal contained in the suggestion by Buoiano quoted earlier.

## References


Armstrong, D. F., Stokoe, W. C., & Wilcox, S. E. (1995). *Gesture and the nature of language*. Cambridge, UK: Cambridge University Press.

Bergen, B. K. (2004). The psychological reality of phonæsthemes. *Language*, *80*, *2*, 290-311.

Browman, C. P., & Goldstein, L. (1992). Articulatory phonology: an overview. *Phonetica*, *49*, 155-180.

Buoiano, G. C. (2001). http://fccl.ksu.ru/winter.2001/discuss.htm.

Corballis, M. (2003). From hand to mouth: the gestural origins of language. In M. H. Christiansen & S. Kirby (Eds.), *Language evolution* (pp. 201-218). Oxford: Oxford University Press.

Donald, M. (2001). *A mind so rare. The evolution of human consciousness*. New York & London: W.W. Norton.

Feldman, J., & Narayanan, S. (2004). Embodied meaning in a neural theory of language. *Brain and Language*, *89*, 385-392.

Firth, J. R. (1930). *Speech*. London: Ernest Benn.

Gallese, V. (2004). Intentional attunement. The Mirror Neuron system and its role in interpersonal relations. *Interdisciplines* (European Science Foundation), http://www.interdisciplines.org/mirror/papers/1.

Gallese, V., & Lakoff, G. (2005). The brain's concepts: the role of the sensory-motor system in conceptual knowledge. *Cognitive Neuropsychology*, *22 (3/4)*, 455-479.

Gentilucci, M., Benuzzi, F., Gangitano, M., & Grimaldi, S., 2001. Grasp with hand and mouth: a kinematic study on healthy subjects. *Journal of Neurophysiology, 86*, 1685-1699.

Heine, B. (1997). *Cognitive foundations of grammar*. New York: Oxford University Press.

Hurford, J. R. (2003). *The language mosaic and its evolution*. In M. H. Christiansen & S. Kirby (Eds.), *Language evolution* (pp. 38-57). Oxford: Oxford University Press.

Lakoff, G., & Johnson, M. (2003 [1980]). *Metaphors we live by*. Chicago & London: University of Chicago Press.

MacNeilage, P. F. (1998). The frame/content theory of evolution of speech production. *Behavioral and Brain Sciences*, *21*, 499-546.

Mallory, J. P., & Adams, D. Q. (1997). *Encyclopedia of Indo-European culture*. Chicago & London: Fitzroy Dearborn.

Markey, Th. L. (1984). The grammaticalization and institutionalization of Indo-European *hand*. *Journal of Indo-European Studies*, *12*, 261-292.

McNeill, D. (2005). *Gesture and thought*. Chicago & London: University of Chicago Press.

Nichols, J. (1998). The origin and dispersal of languages: linguistic evidence. In N. G. Jablonski & L. C. Aiello (Eds.), *The origin and diversification of language* (pp. 127-170). San Francisco: California Academy of Sciences.

Philps, D. (2000). Le sens retrouvé ? De la nomination de certaines parties du corps: le témoignage des marqueurs sub-lexicaux de l'anglais en <CN->. *Anglophonia / Sigma, 8*, 207-232.

Philps, D. (2003). *S*- incrémentiel et régénération submorphémique en anglais. *Bulletin de la Société de Linguistique de Paris*, *XCVIII*, *1*, 163-196.

Rix, H. (Ed.), Kümmel, M., Zehnder Th., Lipp, R., & Schirmer B. (2001). *Lexikon der indogermanischen Verben*. Wiesbaden: Reichert.

Rizzolatti, G., & Craighero, L. (2004). The mirror-neuron system. *Annual Review of Neuroscience*, *27*, 169-192.

Southern, M. R. V. (1999). *Sub-grammatical survival: Indo-European* s-*mobile and its regeneration in Germanic*. Washington: Journal of Indo-European Studies 34 / Institute for the Study of Man.

Studdert-Kennedy, M., & Goldstein L. (2003). Launching language: the gestural origin of discrete infinity. In M. H. Christiansen & S. Kirby (Eds.), *Language evolution* (pp. 235-254). Oxford: Oxford University Press.

Trask, R.L. (1996). *A dictionary of phonetics and phonology*. London: Routledge.

Wallis, J. (1653). *Grammatica linguæ anglicanæ*. R.C. Alston (Ed.), Reprint 142 (1969). Menston: The Scolar Press.

Watkins, C. (2000). *The American Heritage dictionary of Indo-European roots*, 2nd ed. Boston: Houghton Mifflin.