Some comments on the emotional and motor dynamics of language embodiment

A neurophysiological understanding of the Freudian unconscious

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1. Introduction

In this paper a tentative neurophysiologically framed approach of the Freudian unconscious that would function on the basis of linguistic (phonological) organizing principles, is proposed. A series of arguments, coming from different fields, are taken together. First, clinical reports indicate that in a state of high emotional arousal linguistic fragments are treated in a decontextualized way, and can lead to the isolation of phoneme sequences which, independently of their actual meaning, are able to resort emotional effects. Second, phonological and neurophysiological arguments are given to make the case that language processing – be it producing, receiving or imagining language – is a motor event. A crucial distinction is proposed: while contextualized processing correlates on a neurophysiological level with action understanding, and is psychoanalytically akin to secondary processing, decontextualized language processing has a neurophysiological counterpart in object understanding and is psychoanalytically akin to primary processing. Third, isolated speech fragments are therefore considered as objects which, similarly to non-linguistic objects, undergo emotional conditioning and establish an idiosyncratic linguistically structured emotional memory. Phoneme sequences which in this way come to carry high emotional valences are thought to be more readily subject to threaten the bodily integrity, and therefore more readily inhibited. When this inhibition leads to the prevention of effective realization of the voluntary motor output, this is thought to result in the sustained high levels of neuronal activation which seek for release by attracting substitutes that

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are phonemically similar to the censored speech fragments though they are cognitively non threatening. As a result, the speech of the subject would be particularly concerned with the verbalizations of these substitutive phoneme sequences. In summary, the Freudian unconscious is conceived as the instantiation of a linguistic action space which would be idiosyncratically organized by particular phonemic "phantoms" operating as attractors for the subject's (linguistic) actions.

2. With high emotion language breaks into fragments

It is thought that in conditions of high emotional arousal, language is more readily processed in a decontextualized way, falling apart into fragments, from isolated phrases over words to phoneme groups and phonemes and these fragments are thought to gain an organizational autonomy in the process. This is illustrated in a number of clinical observations.

2.1 Que faire?

In a letter to Fliess, Freud (1897/1986) briefly describes the following case:

> A little interpretation came my way (...). Mr. E. had an anxiety attack at the age of ten when he tried to catch a black beetle (...). The meaning of this attack had thus far remained obscure. Now, dwelling on the theme of "being unable to make up one's mind", he repeated a conversation between his grandmother and his aunt about the marriage of his mother (...) from which it emerged that she had not been able to make up her mind for quite some time; then he suddenly came up with the black beetle, which he had not mentioned for months, and from that to ladybug [Marienkäfer] (his mother's name was Marie); then he laughed out loud (...). Then we broke off and next time he told me that before the session the meaning of the beetle [Käfer] had occurred to him; namely: que faire? = being unable to make up one's mind ... meschugge!
> You may know that here a woman may be referred to as a nice "beetle". His nurse and first love was a French woman; in fact, he learned to speak French before he learned to speak German. (...) (Freud (1897/1986:316–331)

It seems that Mr. E. in his analysis describes a childhood anxiety attack while trying to capture a black beetle – or "Marienkäfer" – of which the meaning had thus far remained obscure. When the meaning of this reveals itself to him during the analysis, this does not however result from a semantic analysis of the context of the anxiety attack, but was established by a formal connection

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between the attack episode and another theme that is a potential existential threat to Mr. E. Indeed, at one point Mr. E. describes an episode in which his mother's inability to make up her mind concerning her marriage is the central topic. It is easily understood how this equates to her indecisiveness concerning Mr. E.'s father and therefore can affect Mr. E. at an existential level, namely that of his affiliation identity. There is however no semantic association between this concern and the threat experienced from the beetle, but the link between both becomes clear through a formal, literal analysis of the language used to describe the events. Indeed, it is Mr. E. himself who at one point rereads "Käfer" as "Que faire?" (French for "what am I to do?"), and thereby rereads the object of his anxiety attack, namely the beetle, as a question expressing his mother's inability to choose. It seems that the literal form of the word or word group here functions as a carrier of affects, more or less independently of its semantics and of the global sentence or pragmatic context the words are used in.

2.2 The Ratman

The importance of the literality of the patient's language by which he or she describes his or her own fears, distastes, preferences, problems, symptoms, dreams and associations has been acknowledged by Freud from his early works on (1900/1975; 1901/1960). However, it is Jacques Lacan (1957/1999), benefiting from de Saussure's structural linguistic theory, who formalized these ideas and introduced the concept of the signifier. In Saussurean semiotics a signifier refers to the "sound-image" (or other form of vehicle) which conveys a signified or meaning (de Saussure 1915/1967). It is therefore the phonological sound or orthographic appearance of a word or of a fragment of speech in general.[1] In a psychoanalytical framework, signifiers are attributed important organizational roles in a subject's emotional and mental life. This principle is beautifully illustrated in Freud's case study of the Ratman (Freud 1909/1955).

The Ratman consulted Freud because he suffered from a great obsessive fear. Being in the army, he had heard a senior officer speaking of a certain torment: a pot containing rats was turned upside down on the buttocks of the victim and they bored their way into the anus. The Ratman feared that either his father or a girl he fancied would be subjected to this torment. The fact that his father had died a couple of years before, illustrates the nonsensical character of his fear. Still the idea repeatedly imposed itself on the Ratman, mostly as a threat. He felt the compulsion to do this or another thing in some precise ways lest his fear would come true.

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The irrational character of this fear only becomes understandable when put into the context of the Ratman's life history. Apparently, a central preoccupation at that time was related to a pending choice between two possible spouses. Indeed, while already in love with another lady, the Ratman's mother had informed him, shortly after his father's death, that one of her cousins had declared himself ready to let the Ratman marry one of his daughters. The Ratman therefore found himself confronted with a dilemma concerning who to marry, which is '*Heiraten*' in German. This '*Heiraten*'-problem however also directly referred to the Ratman's father. Shortly before his father got acquainted with his mother, the father had made advances to a pretty but penniless girl of humble birth. The Ratman's father finally exchanged this girl for his mother who was brought up in a wealthy family. The actual dilemma of the Ratman was therefore similar to that which had been his father's: the choice between his love and the wishes of his family.

On a further level of analysis, another, probably crucial reading of the signifier "Rat" also became clear. At one point, the Ratman relates how, as a child, he had a governess with whom he took a lot of liberties: "When I got into her bed I used to uncover her and touch her, and she made no objections." (Freud 1909/1955: 161). He also remembers that a little later she got married to a *Hofrat* (a title indicating a certain status) and was from that point on addressed to as *Frau Hofrat*. The words "*Heirate*" and "*Hofrat*" therefore betray how the signifier "rat" is endowed with references to the Ratman's love life and to his father. The further appearance of the signifier "rat" during the progress of the analysis, such as in *Spielratte*, a financial debt of the father due to gambling and in *Raten*, the money he has to pay for the sessions,[2] elaborates upon this pattern.

In the series of meaningful life events reported in analysis a constant factor progressively appears and seems to repeatedly reappear. However, it does not insist as a semantic constancy, but it does so as a speech fragment, namely the signifier "rat". The Ratman's obsession with the rat torment indeed seems to make sense if the "rat" is not understood in its semantic reading, referring to a rodent, but as a signifier, a phonological speech fragment that is able to refer to different semantic realities but then endows these realities with the same, or reciprocal, emotional qualities regardless of the context. The coherence of the different life episodes, which at first glance might seem completely unrelated, is accounted for by their organization around this one specific signifier, the word "rat" and the obsessive fear precisely arises at this very junction at which these different life episodes come together.

2.3 Patient F. and the 'f'-series

The fragmentation of speech is thought to similarly occur at the level of speech sounds or phonemes, and this is illustrated in a couple of excerpts from a clinical case study, the 22 years old F. who is a residing psychiatric patient.[3] The patient is diagnosed with a thought disorder psychotic syndrome and substance abuse (so called double diagnosis). At the moment of the treatment he is sobered from substance abuse but is treated with anti-psychotic and anti-depressant medication.

F. has a four year younger sister, *Sofie*. When he was seven, another new born sister, *Stefanie*, was adopted. The adoption was not done in legal terms, and several months later the mother took her child back. When he is nine, a new sister, *Steffie*, is adopted. The family structure of the patient is further characterized by numerous position confusions and incestuous relations, between his mother and her father and between uncles and aunts (brothers and sisters) on mother's side. After several months of work F. finally uncovers several probably traumatic, family episodes, also testified by others in hetero-anamneses. During the spring of 2002 he comes to relate a number of incestuous episodes with his sisters, which he obviously feels very guilty of. During the months of May he is subject to severe anxiety attacks and a (three minutes) excerpt of a session on 16.05.2002 in which he first opens up about some experiences with an incestuous character, goes as follows:[4]

> Nature determines everything. Everything comes from nature. Everything has an *eff* ect. (...) Colors have an *eff* ect. (...) Metals don't bend, inox bends. It has *eff* ects due to circumstances. A guy and a girl have an *eff* ect on each other. This is the meaning of life, the *aff* ection, this is per*fe*ct. When done with *ef* fect, it is very well done. The teacher says it is per*fe*ct. (...) Everything has an *effect*. Proteins, all of them, from one to twelve, they have an *eff* ect. To eat [in Dutch: *Fret*ten]. Djezus To eat [*Fret*ten].

F., who is otherwise coherent in his speaking, produces this seemingly incoherent fragment that at first sight doesn't seem to make any sense. What is remarkable in this fragment is the repetition of the phonemes /ĕf/. It is suggested that this is not uncorrelated with the repetition of this same phonemes in both his own first name and that of (all) his sisters, Sofie, Stefanie and Steffie, who were also in this period of anxiety the first role players of the traumatic memories he was uncovering.

At the end of the excerpt something seems to happen: a link is made suddenly from "proteins" (F. fanatically took dried proteins everyday to make his muscles grow) to "*fret*ten" and that word seems to strike him, like he had never

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heard it before: he says in Dutch: "Fretten. Miljaarde. Fretten", starts to laugh and is finally silent upon this, the session is closed.[5] It is as if suddenly F. fully consciously hears the sounds that make up the word "*fretten*" and is struck by this.[6]

3. Language fragments are objects

3.1 Language as a motor act

Language, be it spoken, received or imagined is proposed to be essentially a motor event.

3.1.1 *Spoken language*

Studdert-Kennedy (2000) argues that speaking involves the repeated combining of the discrete actions or gestures of six functionally independent articulators (lips, tongue blade, body and root, velum and larynx). He defines a speech gesture as a fixed configuration of commands prescribing the intended action status for these diverse articulators in order to form a specific speech sound unit. The phoneme or gesture segment is however not the only type of speech motor organization. Studdert-Kennedy and colleagues (Studdert-Kennedy 1991; Studdert-Kennedy & Goodell 1995) sketch a development sequence for the origin of segments, proposing *the holistic word* as the initial unit of linguistic action. The word is said to be holistic because its composing gestures are not yet represented as independent phonetic elements that can be marshaled for use in an unbounded set of other contexts (Studdert-Kennedy 2000: 280). As an automatic consequence of sorting and stacking phonetically similar words, it is then thought that independent gestures eventually emerge.

Davis and MacNeilage (1995) present the syllable, or "frame", as an early fundament in the shaping of speech, as characterized from an articulatory point of view by the opening and closure of the mandible. MacNeilage (1998) argues that frames may derive from ingestion-related cyclicities of mandibular oscillation associated with chewing, sucking and licking which took on communicative significance as lipsmacks, tonguesmacks and teeth chatters.

3.1.2 *Perceived language*

The "Motor Theory of Speech Perception" (Liberman & Mattingly 1985) proposes that the auditory properties of a spoken segment can not be labeled phonetically without specifying their articulation. In other words, to identify

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speech listeners must access their motor system. There has been a recent neural instantiation of this theory by Rizzolatti and Arbib (1998). These authors report that in monkeys a part of the premotor cortex (F5) contains neurons – the so-called "mirror neurons" – that discharge both when the monkey grasps or manipulates objects and when it observes the experimenter making similar actions. They also show that there are mirror neurons in F5 that respond both when the animal makes lipsmacking movements and when it observes them in others. Of particular importance is the fact that area F5 in the monkey is the probable homologue of Broca's area in humans. There is some parallel argumentation that the origins of human language might be situated in manual gesture rather than in vocalization (Corballis 1999). Recently, Callan et al. (2002) have shown that the presence of such mirror neurons in human speech motor areas may explain why lip-reading enhances the intelligibility of what a person is saying. This finding adds strength to the argument that speech evolved from a primitive gestural system of communication and indicates on a neurological level the participation of the human motor system in the intelligent decoding of received speech. Similarly, Zatorre et al. (1992, 1996) have argued that the mapping of the incoming speech stream onto the linguistically relevant units activates Broca's area.

3.1.3 *Imagined language*

Several studies have found evidence for the activation of Broca's area in linguistic tasks that do not involve any overt speech (e.g. Friedman et al. 1998; Ryding et al. 1996; Wise et al. 1991). McGuire et al. (1993, 1996) provide evidence that in normal subjects inner speech activates Broca's area. Data also show that auditory hallucinations in schizophrenics are related to the subvocal production of speech (Green & Preston 1981; Bick & Kinsbourne 1987; Liddle et al. 1992) as if they were in fact producing speech and misattributing its origin (e.g. David 1994). Moreover, brain activity recorded during verbal hallucinations is similar to that observed during production of inner language and auditory verbal imagery in normal subjects (Cleghorn et al. 1992; Silbersweig et al., 1995).

3.2 Language fragments are objects, not actions

3.2.1 *A difference between actions and objects*

A neurophysiological difference. Object and action observation, most prominently tool (use) observation – and to a lesser extent voiced object and action naming – all seem to activate premotor circuits that would be involved in the

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actual use of the object (Grabowski et al. 1998; Grafton et al. 1997). Grafton et al. comment:

> (...) it is possible that premotor activation (dorsal and ventral) play a role in describing the object meaning via fronto-temporal recurrent circuits. To categorize an object, it is not enough to have a description of its visual characteristics; it is necessary also to understand its use. The premotor activations may subserve the motoric aspects of object semantics. (Grafton et al. 1997: 235)

These authors therefore point to a role for the motor circuitry in the semantics of both objects and actions. However, recently separate neurophysiological pathways for object and action understanding were disentangled. Indeed, the monkey ventral premotor area F5 can be functionally parceled in two sectors of neurons that code for goal-related hand movements (cf. Gallese 2000): mirror neurons are clustered in one sector (cortical convexity), and so-called "canonical neurons" in the other (within the inferior limb of the arcuate sulcus). These neurons differ for their visual responsiveness: while both classes are functioning during active manipulation of objects, mirror neurons selectively respond to action observation, while canonical neurons selectively respond to object observation and are *not* activated by action observation (cf. Gallese 2000).

There is, in our view, a crucial distinction that is coded for here: object observation, *independently of the context the object is presented in*, results in the activation of their canonical neurons, i.e. of the motor circuitry that the characteristic use of that object would imply. Suppose, for example that scissor observation activates a characteristic "cutting" motor circuitry, thereby signaling the typical use of this object to the observer (and hence, part of the object's meaning). Scissor observation, even in a context where the scissors are *not* used for cutting, but e.g. for pushing or grasping another object, is thought to be capable of activating the cutting motor circuitry, even if not appropriate in the given context, and it is thought this would be mediated by canonical F5 neurons. At the same time, since the mirror neurons are supposed to be activated by the *intention, goal or aim* of the movement, independently of the means by which this movement is executed (cf. Gallese 2000), the "pushing" or "grasping" (and not the "cutting") mirror neurons are supposed to be activated upon observation of this gesture. It is therefore proposed that the cognitive results of the activation of these motor circuits are qualitatively categorically different: canonical neuron activation subserves the semantic understanding of the *object*, while mirror neuron activation is central to the comprehension of the intention of the other ('s *action*).

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A psychodynamic difference. This difference is crucial from the viewpoint of a mental apparatus. Object observation gives rise to neuron activity in a decontextualized way, independently of the relational disposition of objects and agents. Action observation, in contrast, gives rise to neuron activity in function of the intended goal of the agent, and is therefore critically dependent on the relational disposition of objects and agents. It is therefore conceived that object observation induced canonical neuron activation is induced by the sole attributions (or features) of the observed object, independently of its intentional or relational position and that, as such, it is akin to a Freudian primary process kind of activity (cf. Freud 1895/1966; 1900/1975; 1915b/1957). Rapaport (1951: 708) summarizes the primary process concept as follows: "Where the primary process. . .holds sway. . .everything belongs with everything that shares an attribute of it. . .". Primary processes are thus characterized by automatic association processes based upon feature similarities. Action observation induced mirror neuron activation, in contrast, is sensitive to the relational configuration of the situation and as such, akin to Freudian secondary processes. Secondary processes, indeed, are those characterized by reality verification, thereby implying that the actually applying contextual conditions and relations are taken into account (Freud 1895/1966, 1900/1975, 1915b/1957).

In summary, while motor neuron circuitry activation is central in the proposed understanding of both actions and objects, objects are conceived as isolated elements grasped on the basis of their attributes (cf. primary process), while actions are pictured as relational concepts grasped by an understanding of their intention on the basis of the positional configuration of the global context in which they are observed (cf. secondary process).

3.2.2 *A difference between linguistic actions and linguistic objects*

Linguistic objects. In "On aphasia" Freud (1891/1978: 77–78) makes a crucial distinction between the "object associations" (in German "Objektvorstellung") and the "word concept" ("Wortvorstellung"). In the original version therefore, Freud indicates both levels as *Vorstellungen* – i.e. (re-)presentations – indicating a certain similarity in status between both. Freud further notes:

> The word, then, is a complicated concept built up from various impressions, i.e., it corresponds to an intricate process of associations entered into by elements of visual, acoustic and kinaesthetic origins. However, the word acquires its significance through its association with the "idea (concept) of the object" ["Wortvorstellung"], at least if we restrict our considerations to nouns. The idea, or concept, of the object ["Objektvorstellung"] is itself another com-

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> plex of associations composed of the most varied visual, auditory, tactile, kinaesthetic and other impressions. (Freud 1891/1978: 77–78)

For Freud (1891/1978: 73–77), the "word presentation" implicates an acoustic component, "the acoustic image" and a motor component or "speech movement representation", the kinesthetic feedback of the articulatory system. This word presentation level has a finite number of components and is as such to be distinguished from the "object presentation" level. This object level has an infinite number of components, including the visual, acoustic and tactile recordings of the object. The object "banana" e.g. is coded as the collection of impressions of its visible features, of its taste and odor, of its texture, but automatically associated are also the motor patterns of peeling, eating or crushing it. Therefore, the point Freud (1891/1978) is making, is that humans do not simply have a neurological level where the features of e.g. the object "banana" are coded, they also have a distinct neurological level where *the features of the word* "banana" are coded. Moreover, Freud (1891/1978) in his scheme indicates that *words* are*, similarly to any other type of object*, coded as the collection of impressions of their perceptual and motor features. Word-features are therefore, according to Freud (1891/1978), coded in much the same way as the features of any other type of (non-word) object. There is no a-priori reason why at first instance the sounds of language should be treated by our brains in any kind of special way different from other objects, present in the material space.

This point of view bears some similarities with Caramazza's schematization (1996) of the work of Damasio et al. (1996) on the lexical nature of language. Damasio et al. (1996) report that some patients with focal brain lesions loose the capacity to *name* objects of defined categories, like plants or tools, while they obviously still know the object itself, since they are able to describe it. Damasio's group therefore indicates a possible neural basis of what was predicted by (psycho-)linguists, namely the lexicon (e.g. Levelt et al. 1999), i.e. a material storage for "words in our heads" (Frost 1998). The particularity of the work of Damasio et al. (1996) is the finding that words of the same category (like plants, tools, and persons) are neuroanatomically grouped together in multiple regions of the left cerebral hemisphere, outside the classic language areas. Similar findings are described by Caramazza and Hillis (Caramazza & Hillis 1991; Hillis & Caramazza 1995) for grammatical classes of words. Caramazza (1996: 486) comments these findings as follows: "(...) category-specific naming failures can be attributed to a deficit in *lexical* retrieval and not in *semantic* processing." This view crucially contends that category labels (like "tools/plants/etc." or "nouns/verbs/etc.") are coded lexically or at the level of

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the "words" and not or not only semantically or at the level of the objects. The lexical level might be conceived as the level that features the words as the neurophysiological objects *in se*. It is most probably phonologically coded (e.g. Frost 1998), or bears the information for the phonological assembly of the word (cf. Levelt 2001). For these reasons, it seems in our view similar to Freud's word presentation level (Freud 1891/1978), where words are similarly treated as objects, coded as their sound image and articulation pattern.

Linguistic action perception competing with linguistic object perception. If we now take these different observations together and imagine a particular situation in which the "Ratman" for example hears the sentence: "There is a rat in the kitchen." As detailed higher, perception of this sentence is thought to induce motor phoneme activation. This phoneme activation is then thought to participate in two cognitive processes, namely the perception of the speech act and the perception of speech fragments (objects), much like object use observation is recorded to induce both perception of the object (canonical neurons) and perception of the object use (mirror neurons). While perception of the speech act would allow for access to the *intention* or contextual meaning of the speaker, it is proposed that in high anxiety contextual decoding has to compete with a decontextualized activation induced by the speech fragments. Instead of participating to a meaningful syntax, the speech act is then not or less perceived as such but "degrades" to the perception of isolated speech objects, such as words or phoneme groups. In the psychic system of the Ratman e.g. contextual processing of a sentence such as "There is a rat in the kitchen." would have a hard time competing against an autonomy of associations induced by the fragment /rat/.

3.3 Language fragments and emotional memory

3.3.1 *Emotional memory*

When we consider language fragments as objects, it makes sense that, similar to other objects, phoneme sequences are subjected during maturation to an "emotionally conditioning" process as proposed by Ledoux (1993, 1994).

Central to his theory is the wedge-like splitting of the neuronal trajectory of a single input train into two pathways, one subcortical or limbic and the other neocortical. The limbic trajectory accounts for the rapid affective evaluation of the stimulus in function of a memory system established by conditioning while the neocortical trajectory accounts for the slower rational (contextual) analysis of the same stimulus. The wedge-like splitting in the thalamus indicates that

both pathways, while being intensively intertwined, nevertheless function in a relative autonomy from each other. The limbic pathway moreover is both phylogenetically old and ontogenetically early: the systems are functional before birth and immediately start establishing an emotional memory on the basis of conditioning of raw input material. The neocortical trajectory is both phylogenetically more recent and ontogenetically late: cortical maturation is not achieved until six to ten years after birth. Therefore, it is only with some delay that an articulate mature "cognitive" analysis of the input material can be fully achieved and stored in the semantic fields.

A central structure in the limbic pathway are the amygdala which analyze auditory input in order to identify stimuli which are emotionally significant (e.g. food, predator, sex partner). Upon detection, they activate brainstem structures and modulate hypothalamic activity so that the organism can take appropriate (behavioral and vocal) action (LeDoux 1996; Rolls 2000). Moreover, Ledoux (1993, 1994) has shown how the amygdala, in interaction with the hippocampus, act as an interface for the encoding into memory of a level of fear (or autonomic and behavioral readiness) corresponding with respective incoming (auditory) stimuli. In humans, the amygdala receive direct input from the auditory areas in the temporal lobe, interact with the cingulate gyrus and project not only to Wernicke's area, but continuing through the inferior parietal lobule, also to Broca's area (Gilles et al. 1983). Not surprisingly, the human amygdala were shown to participate in the enhancement of both perception of and memory for emotionally arousing stimuli (Adolphs et al. 1997; Anderson & Phelps 2001; Cahill et al. 1995). Linguistically, they respond to complex auditory affective stimuli including words and sentences (Halgren 1992; Heit et al. 1988; Isenberg et al. 1999). It is therefore tempting to propose that, like other objects, the language object is as appropriate an input stimulus as another and is therefore also considered to be subject to emotional conditioning (at the level of the amygdala).

3.3.2 *Language fragments are encoded in an emotional memory*

The first constituting elements of the maturing linguistic system have been described as holistic words – or for that matter, any holistic phrase – before even the emergence of fully articulated phoneme segments (Studdert-Kennedy 2000). This means that the first steps towards articulated language are given by a cultural environment. Moreover, this environment is in these early years directly emotionally active, since its effects are then still unmitigated by the influence of the not yet mature neocortex. We therefore can assume that in each individual, language matures with a particular emotional history. Though it is

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clear that different languages bear different phoneme, intonation and prosodic patterns, the point we wish to make is that this emotional linguistic memory is more than only culture specific. It is an idiosyncratic linguistic memory and is colored by important circulating "signifiers" in the history of the individual and of its family.

In an ontogenetic perspective this results in the constitution of an emotional language memory in which particular phoneme sequences are linked to particular levels of emotional activation in function of a particular history. Since this emotional activation is situated at a subcortical level, it is thought to happen in a relative independence of the neocortical semantic operations, where the same linguistic input would be disambiguated in function of the context. It is therefore thought that in presence of a given linguistic input, the phonological structure of this input is in itself and with a relative autonomy capable of activating a certain level of emotional arousal, while at the same time and in parallel higher order processes are disambiguating the linguistic input in line with the given context.

In contrast to the semantics, which serve the purpose of communication and thereby function upon a common or shared understanding of its signification, the emotional signification is private or, at the most, shared within the same "emotional" community like e.g. the core family. That is, phoneme choices are irrelevant for semantic communication – it doesn't matter if you say "father" or "dad", their semantic definition is the same. In terms of emotional activation, however, there might be a world of difference between "father" and "dad", but this will depend upon the particular person and its history.

In summary, it is proposed that phonology, by the biology of its circuitry and of its maturation, acquires a particular emotional significance in each individual, that is thought to be stored in an emotional memory system and codes for the need for recruitment and intervention of bodily (autonomic) systems upon activation (by hearing, speaking and/or internal ruminating) of these phoneme sequences.

4. A hypothetical model for the dynamic unconscious

4.1 Repression and phantoms: Intentions not acted upon

In his model of the dynamic unconscious[7] Freud (1915b/1957: 202) defines repression in operational terms: "A presentation which is *not put into words*, or a psychical act which is *not hypercathected*, remains thereafter in the Uncon-

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scious." Repression therefore might be characterized by a state of "cathexis" without effective musculatory enactment of this cathexis, be it the musculatory enactment of a linguistic (namely articulatory) or of a non-linguistic motor output. A tentative physiological translation of this dynamic can be drawn. It has been established (Roland et al. 1980) that mere planning of a movement sequence (without execution) activated the supplementary motor area (SMA), whereas planning of the same sequence followed by execution activated both the SMA and the primary motor area (see also Roland 1984; Fox et al. 1987). Focusing on the desired goal of an action, Jeannerod also suggests that SMA neurons, encoding the desired "final configuration" of the body, would continue firing "until the final goal has been reached" (Jeannerod 1994: 201). He adds:

> One possibility would be that these neurons encode final configurations (of the environment, of the body, of the moving segments, etc.) as they should arise at the end of the action, and that they remain active until the requisite configuration has been attained. This sustained activity would represent the reference (the goal) to which the current state of execution of the action would be compared (Jeannerod 1990). These neurons would accordingly remain activated as long as the represented action was not completed, including in situations where the execution was blocked. (Jeannerod 1994: 201)

One way in which the desired-for body configuration (i.e. the intention) and the actual body configuration are compared is through the so-called "comparator" model first postulated by physiologists to account for the compensation of the visual system for retinal displacement during voluntary eye movement (the corollary discharge model, Sperry 1950; the efference copy model, Van Holst 1950). However, it appears that sensory predictions produced in conjunction with the motor command are not restricted to eye movements but also provide perceptual stability in the context of all self-produced actions (see e.g. the central monitor model, Frith 1992 or the internal forward model, Wolpert 1997) According to these theories, the comparator is a specialized structure which receives action-related signals from internal and external (sensory) sources. During a self-generated action, internal signals, which are a copy of the commands sent to the effectors (and which therefore reflect the desired action), are sent to the comparator. These internal signals (or efference copies) create therein an anticipation of the consequences of the action. When the action is effectively executed, sensory signals generated by the movement or reafference signals (such as proprioceptive or visual information) also reach the comparator. If these sensory signals match the anticipation of the compara-

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tor, the desired action is registered by the system; if they do not, a mismatch between the desired and the produced action is registered.

Putting Jeannerod's and these considerations together, one might deduce that the mismatch between intended and achieved action thereby "fuels" or drives the sustained activation of the SMA neurons. Importantly, Jeannerod also suggests that in the case "where the action could not take place, the sustained discharge would be interpreted centrally as a pure representational activity and would give rise to mental imagery." (Jeannerod 1994: 201). This hypothesis would thereby provide for a satisfactory explanation to a number of clinical observations. For example, it is thought that the sustained activation of SMA neurons due to a right frontomesial lesion in patient E.P., reported by McGonigle et al. (2002), is the cause of her intermittent experiences of a supernumerary "ghost" left arm in the so-called "action space". The central representational hypothesis of non-realized but yet intended movements would also fit with the explanation proposed by Ramachandran for the understanding of phantom limb experiences, especially those implying "the vivid gesticulation and other spontaneous movements" of these phantoms (Ramachandran 1994: 314). Indeed, Ramachandran (1994) posits that "the sensations arise from reafference signals derived from the motor commands sent to the phantom" (Ramachandran 1994: 314; where "reafference" is actually to be understood as the efference copies, since they are "*derived from the motor commands")*.

For all these reasons, the contention that repression is characterized by the lack of musculatory realization of the cathexes might be understood on a neurophysiological level as a sustained mismatch at the level of the comparator, resulting in sustained SMA neurons activation (e.g. for the articulation of the repressed word presentations), and thereby resulting in the emergence of linguistic "phantoms" which would be of an articulatory or phonological nature.

4.2 The dynamic unconscious: A linguistic action space organized by phonemic attractors

For Freud, however, repression always is the result of two forces, one pushing a representation, while the other is attracting it:

> It is a mistake to emphasize only the repulsion which operates from the direction of the conscious upon what is to be repressed; quite as important is the attraction exercised by what was primarily repressed upon everything with which it can establish a connection. (Freud 1915a/1957: 148)

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Once the cathexis is withdrawn from the presentation that has to be repressed, this cathexis is transferred to a substitutive word-presentation that is associated with the repressed presentation. Importantly, these associations seem to function on the basis of linguistic or verbal similarities: condensation, metaphor, assonances, punning associations, etc. (Freud 1900/1975: 596). Therefore, it is these substitutive word-presentations which are thought to act as the attracting forces at work in repression: in their capacity of representing previous acts of repression they operate by attracting new material and thereby function as an indication of the repressed, a marker of the unconscious.

Taking all this together, the following approach of the dynamic unconscious is proposed. During an individual's particular history specific phoneme sequences or speech fragments acquire a specific affective valence which is encoded in an emotional memory system (see also Bazan et al. 2002). These affective valences can be understood as the potency for these speech fragments to induce a more or less important mobilization of the body's flight-fright-fight circuits. Highly anxiously valenced fragments more readily threaten the bodily integrity and therefore are more readily subjected to inhibition. When this inhibition then leads to the prevention of effective realization of voluntary acts, more precisely of voluntary speech acts, this results in the sustained high levels of (SMA) neuronal activation. Since this situation of high potential energy is also unstable, the high neuronal activation seeks for realization and in doing so "attracts" substitutes which are phonemically similar to the censored speech fragments though cognitively non threatening (e.g. "*effect*" instead of "*Steffie*") – i.e. what Freud calls the "substitutive word presentations associated with the repressed presentations". As a result, the speech of the subject would be particularly concerned with the verbalizations of these substitutive word presentations, which therefore might be considered to act as organizing principles. As indicated higher, these substitutive phonemic fragments could be thought of to be akin to the limb phantoms, as was e.g. observed by McGonigle et al. (2002). In other words, it is thought that recurrently active but unspoken phonemes can give rise to central representational activity, creating what we tentatively label as "phonemic phantoms in a linguistic action space". One way to conceive of the dynamic unconscious therefore would be that it appears as the instantiation of a linguistic action space which would be idiosyncratically organized by particular phonemic phantoms operating as attractors for the subject's (linguistic) actions.

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Notes

1. For a reframing of this concept in terms of brain correlates, see also Bazan 2001; Bazan et al. 2002b.

2. The Ratman would have the habit to internally count the money he pays his sessions with as "Eine Rat, Zwei Raten, etc.".

3. Though the patient stays anonymous, some of the punctual data concerning the patient were changed so as to further make the clinical description unrecognizable. This was done with safeguard of the evidence character of the presented material as in respect to the case it claims to make.

4. Translated by the first author from the Dutch: "De natuur bepaalt. Alles is van de natuur. Alles heeft een effect. (...) Kleuren geven effect. (...) Metalen plooien niet, inox plooit. Het heeft een effect door omstandigheden. Een vent en een vrouw hebben effect op elkaar. (...) Alles heeft een effect. Proteïnen, eiwitten, in de sport laten de spieren in massa toenemen. Fretten. Miljaarde. Fretten."

5. The theme of "eating" (popularly *fretten*) is a central theme in the family, especially between F. and his mother. Mother was fed by her father as soon as she got pregnant of F. Mother: "Father always would make double meals, because I used to systematically throw the first one over." Food is extremely (de-)regulated in the household, by a culture of pills, vitamins, healing substances and so on. Mother always judges F. upon his (gain or loss of) weight on her visits and would try to get feedback from her son upon hers.

6. In another session F. would again play with this word "*fretten*" as well as with similar sounding variations upon his own name. He then would make the jump to his fascination for terrorist organizations, with amongst others the 'ETA', which he suddenly would interpret as "Eet da!" ("Eat this!").

7. For a comprehensive comment on the linguistic dynamics in the Freudian unconscious, see also Van Bunder et al. (2002).

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