Social Signals: A Psychological Perspective

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Social signals: A psychological perspective

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Abstract: The chapter defines social signals as communicative or informative signals that directly or indirectly provide meanings concerning social interactions, social attitudes, social relationships and social emotions, and presents classical literature and recent research on social signals in the domains of cognitive and social psychology. In terms of the modalities exploited, it overviews some cases of gestures, head movements, and gaze items as social signals. In terms of the meanings conveyed, special focus is devoted to persuasion and agreement, the former seen as a way to influence others' attitudes, the latter as a possible outcome of a persuasive process: the persuasive import of gesture and gaze, and the function of words and body signals in agreement are highlighted. In the realm of social relationships, the relation of dominance and the blatant and subtle signals that convey it in political debates are illustrated; finally the nature and function of the social emotions of shame, pride and enthusiasm are described, and some studies are presented on their multimodal communication.

Introduction

Along the whole twentieth century, a large part of Psychology was devoted to explicate and measure intelligence, meant as the set of cognitive skills (memory, inference, insight, reasoning) that allow humans to solve problems and adapt to environment. Only at the end of the century, after the growth of the cognitive over the behaviorist approach and the rejoining of emotion and cognition, studies by Salovey and Mayer (1990), Damasio (1994) and Goleman (1995) showed that cognitive processes like decision making cannot do without the contribution of emotional processes and introduced the notion of "emotional intelligence", the capacity of expressing one's emotions, understanding others' emotions and being empathic with them, as a great part of a human's capacity for adaptation. At the beginning of the third millemnium the notion of "social intelligence" was finally proposed: a set of skills that include understanding of other people's feelings, seeing things from their point of view (Goleman 2006) and giving them effective responses (Gardner 1983), but also machiavellian intelligence, the capacity to understand what others want to better manipulate them. A notion taken up as particularly relevant in managerial psychology, and viewed as a weapon for leadership, so much as to be seen as "the science of success" (Albrecht 2005). An important part of Social Intelligence is the delivery and comprehension of Social

Signals, the signals that inform about an ongoing interaction, or a social relationship, an attitude taken or an emotion felt toward another person.

2. The dawn of social signals. From Computer Science to Social Psychology and back

In 2007 Alex Pentland, working at MIT in the areas of computational social science and organization engineering, first introduced the notion of "social signal processing" and applied signal processing techniques to what he called "social signals", the non verbal aspects of communication including interactive and conversational dynamics, to predict the outcomes of a negotiation or of a speed date within its very first minutes (Pentland 2007; Curhan and Pentland 2007). Later, he contended that prosodic emphasis, mirroring, conversational turn-taking, and activity level, are "honest signals" that allow to predict the outcomes of speed dates, negotiations, and other types of social interaction (Pentland 2008). These works were primarily based on findings of social psychology concerning the role of non verbal behavior on conversation and social interaction. A first input was an intriguing study by Ambady and Rosenthal (1993), "Half a minute: Predicting teacher evaluations from thin slices of nonverbal behavior and physical attractiveness" which demonstrated that judgments of personality are based on very "thin slices" of non verbal behavior, thus reinforcing Asch's hyphotesis about the strong human capacity to form an accurate impression of people as a precondition to social life (1946). A silent video of 30 seconds was a strong predictor of teacher's evaluations at the end of semester; but even when replicated with a shorter video of six seconds, results confirmed the "thin slice" hyphotesis The idea of "social signals" was also inspired by studies on the role of non verbal behavior in impression formation. For example, smile and rapid body movement were judged as extraversion cues (Kenny et al. 1992), while physical attractiveness predicted sociability and social competence (Eagly et al. 1991). Similarly, within research on self presentation (DePaulo 1992) non verbal behavior was seen as a cue to impression management often intentionally driven. As pointed out by Goffman (1971), "tie-signs" are used by people in personal relationships to make clear the nature of a relationship or to reinforce it: a man gazes or orients his body towards his interlocutor more frequently if the interlocutor is a female than a male, and in the former case he does so more often during an intimate than an impersonal conversation.

Other contributions come from studies on facial expression (Ekman and Friesen 1975; Ekman et al. 1972; Ekman et al. 2002) and on gestures and other modalities (Rosenthal et al. 1974). Ekman (1979) distinguished facial movements into *emotional signals* and *conversational signals*; the former, not totally under voluntary control, leave room for the detection of deception through *leakage cues*

and *deception cues*: in leakage, due to cultural or social norms an unfelt facial expression is only superimposed to the expression of the really felt emotion, thus revealing the information concealed; while deception cues are micro displays so brief that they are very difficult to detect (DePaulo et al. 2003).

Much of the research above highlighted the relevance of automatic processes that are not under conscious control (Bargh 1990; 1994) but nonetheless heavily determine social perception and social cognition.

Based on these works, since 2009 the European Network of Excellence SSPNet has put the bases for a new research field in "Social Signal Processing", concerning the cognitive modeling, analysis and synthesis of social signals.

Although much empirical research has been done in social psychology, apart from some first work in the SSPNet (Cowie al. 2009; Vinciarelli et al. 2009; Poggi and D'Errico 2010), no clear definition of "social signals" has been given yet. But to set a new research field a clear definition is needed of what is inside and what is outside the field. In this chapter we provide a definition of social signals and present some recent studies in this area, taking the perspective of a model of mind and social action in terms of goals and beliefs.

2. Social Cognition. How others are represented in our mind and our brain

A central area of research to understand the processes that allow the perception, memorization and representation of social signals in the human mind is "Social Cognition" a psychological approach that studies how people interpret and attribute meaning to one's own and others' behaviors. The pioneering work of Bartlett (1932) on *schemes* pointed out a central axiom in the social cognition approach: the representational nature of our knowledge. He demonstrated that memory reconstructs its stored events since it is oriented to making memories coherent with reference schemes. But also categories like status, role, human groups, at least in their default working process, are uncontrollable and unintentional because they respond to *laws of cognitive economy* (Fiske and Taylor, 1991). Perception, memorization, judgement follow an automatic path, in absence of "motivation" and "opportunity" of time and resources; categories and schemes influence information on the basis of accessibility in terms of past experience or primacy effect (i.e., what is seen/heard first: Higgings, Rholes and Jones, 1977); and, as demonstrated by Asch (1946), to have a coherent description of a person we organize impressions as a whole starting from few first elements. Finally, categorization – the clustering of different elements on the basis of one shared condition – simplifies social perception and social judgement by making external stimuli more accessible and triggering sets of information focused on particular objects, interrelated and organized in schemes (Fiske and Taylor, 2008). Even the discriminative

behavior towards outgroup members is generally triggered on the basis of automatic activation of belonginess categories (Bargh, 2006).

Research in neuroscience has investigated the neural underpinning of social cognition by demonstrating that processes involved in social perception and behavior, like perception of conspecific, and memory and behavior concerning others, activate different neural systems from the perception of objects (Adolphs 1999). And the discovery of mirror neurons – the neurons activated not only by one's motor action, but also by the perception of action in a conspecific (Rizzolatti and Arbib 1998) – demonstrated how humans are programmed for empathy (Gallese 2006), the representation of self and others (Uddin et al., 2008), learning from others through imitation (Meltzoff and Decety 2003; Iacoboni 2005), and joint action (Vesper et al. 2010). A further demonstration of their importance comes from studies that suspect impairment of these structures in autism (Williams et al. 2001; Oberman et al. 2005), where the capacity for a Theory of mind (a representation of the other's mental states, like emotions, goals and beliefs) is disrupted (Baron-Cohen 1995; Gallese 2006).

In this work we adopt the view of social cognition put forward by a model of mind and social action in terms of goals and beliefs.

3. A goal and belief model of mind and social action

In the model of mind, social action and communication designed by Castelfranchi and Parisi (1980), Conte and Castelfranchi (1995), Castelfranchi and Poggi (1998) and Poggi (2007), the life of any natural or artificial, individual or collective system consists of pursuing *goals*: regulating states that, as long as perceived as not realized in the world, trigger the system's action. To realize a goal a system performs plans, i.e. hierarichical structures where all actions are means for goals and possibly superordinate goals (supergoals). This requires internal resources (*beliefs* and *action* capacities) and external resources (material resources, world conditions). When a system lacks the power to achieve goals on its own due to lack of necessary resources, it may *depend* on another system endowed with those resources, and need the other to *adopt* its goals, i.e., help to achieve them. The social device of *adoption* – a system pursuing another's goal as its own – multiplies the power to achieve goals for all systems. Further, a system may need to *influence* another (induce it to pursue some goals), either for its own sake (e.g., a master giving orders to his slave) or for the sake of the influenced system (a father giving advice to his child).

Beliefs are an essential resource to achieve goals. A belief is information about some state of the external world or of the system (like "it is sunny now" or "I am hungry"), represented in a sensorimotor or conceptual format, not necessarily in a conscious way. Beliefs are necessary to choose the goals to pursue, assess pre-

conditions and adequate plans; hence the necessity to acquire, process, store and use beliefs, for all systems, including animals and machines, but more so for humans. Humans and higher animals acquire beliefs through *perception*, *signification* and *communication*, and process and store them in long-term memory, connecting them in belief networks through links of time, space, part-of, class-example, cause, goal, condition, and thus generating *inferences*: new beliefs drawn on the basis of others acquired through perception or retrieved from memory. The difference between perception and the other sources of beliefs is that while in the former the information drawn is, so to speak, not distinct from the perceptual information (from seeing *clouds* I come to know there are *clouds*), in inference, signification and communication there is a splitting between the information drawn and its source: from mother saying *Stay home*, I understand *mama wants me home* (communication), from seeing *clouds* I understand *rain soon* (signification, meaning), from *rain* I predict *mama won't let me out* (inference).

In signification and communication, from a perceivable stimulus, a "signal", we draw a "meaning". A meaning can be seen as a privileged and pre-determined inference: when a perceivable stimulus has generally given rise to the same inference, this has become linked in memory to that perceivable stimulus and is systematically drawn from it thanks to a stable connection shared by a group through biological coding or cultural learning.

4. Social signals. A definition

We define a signal as any perceivable stimulus from which a system can draw some meaning, and we distinguish informative from communicative signals: a *communicative signal* is a perceivable stimulus produced by an animate system (a self-regulated Sender) having the goal to provide information to another system (Addressee); an *informative signal* is one from which some system (Receiver) draws some meaning without necessarily the intention, or even the existence, of a Sender intending to convey it.

We define signals as "social signals" on the basis of their meaning, i.e., their concerning "social facts". A *social signal* is *"a communicative or informative signal which, either directly or indirectly, provides information about "social facts", that is, about social interactions, social attitudes, social relations and social emotions* (Poggi and D'Errico 2010b; forth.).

4.1. Social and non-social, informative and communicative signals

Suppose in the mountains you see on the ground some splinters from the horns of a Big Horn; if you understand there has been a contest between two big horns, this is for you a *social informative signal*: *social* because it concerns a social interaction between Big Horns, and *informative* because the Big Horn did not have the goal to inform you of the contest. But if you simply see the footprints of one Big Horn, and hence you can tell he crossed the wood, this is an *informative non-social* signal. Again, if during a class break I see that some children are close to each other forming a circle, but one is slightly outside the circle, I might predict that child is somewhat isolated from the group, possibly at risk of being bullied, though no one in the group wants to communicate to each other or to that child that he is somewhat isolated. The children's spatial location is a a signal informing, not communicating on purpose, about some social relation.

Now suppose you observe mimicry between two teenagers talking together: each inadvertently imitates the other's movements and posture; a signal of syntonization. For you, as an external observer, this is an *informative social signal*, since they are not communicating this to you. Between them, instead, this counts as a *communicative social signal* because through mimicry they communicate their reciprocal affinity to each other.

4.2. Communicative signals and their communicative goals

In communicative signals (both social and non-social ones), the goal of conveying information is not necessarily a conscious intention, i.e., a deliberate and aware communicative goal of an individual, as it is generally the case, in humans, for verbal language or some codified gestures. Animals' signals are governed by biological goals of communicating, but also in humans the goal to convey information may be an unconscious goal, or even a social end or a biological function. Some examples: if I have a bad opinion of you because you offended me, I can insult you deliberately; in this case my goal of communicating my negative evaluation of you is conscious: I not only want to offend, but I also know I want to offend. An *intention* is a conscious goal, i.e., one not only represented, but also meta-represented in my mind, while an unconscious goal is one I have but I do not know (I somehow conceal from myself) I have it. Take this case by Ekman (1975): a student is being treated in an offensive way by her professor, to whom she cannot obviously show anger; so she is forced to answer him in a polite way. But at the same time on her knee she is extending her middle finger in an obscene insulting gesture that contradicts her hypocritical politeness. Here, if at a conscious level she does not want to offend, at the same time she does have the goal

to express her anger and to insult in turn; but if due to her family education she is a very polite girl, she might not even be aware of this latter goal. If this is the case, her extended middle finger is a communicative social signal, but one triggered by an unconscious goal. Like mimicry, the imitation of one's interlocutor's movements, that generally occurs without awareness.

Some communicative social signals are governed by social ends, that is, goals not primarily of an individual, but of the society: for instance those that convey information about social roles and social identities, such as uniforms or status symbols. A cop's uniform tells us, on behalf of the whole society, that the one who wears it plays a particular social role; a Ferrari tells us its driver belongs to a group of very rich people. Other communicative social signals governed by biological goals are those of sexual identity (a man's beard), sexual readiness (a stickleback's reddened abdomen, a woman's pupil dilation), and some emotional signals like blushing (see Sect. 5.4.1).

In general, many entities and events can work as social informative and communicative signals: individual and collective actions (a letter of complaint, a strike); morphological features, either transitory (blushing that expresses shame) or permanent (a woman's breast as a signal of sexual identity); objects (a Ferrari or a uniform), but also combinations of actions: simultaneous (many people applauding at the same time) or sequential (mimicry). Of course, while individual actions are generally driven by individual conscious goals of communicating, morphological features are ruled by biological ones, and objects often by social ends. For actions of more people, those that are pre- and co-ordinated, like a strike, may still have a conscious goal, thus being *communicative social signals*; but if thousands of people click on the same video on youtube, this is an *informative social signal*.

This has important consequences as to their reliability. With *communicative signals* we come to know something from someone else, who potentially might want to mislead; *informative signals* instead, but also *communicative signals* that are not under conscious control, are in principle more reliable; with them, at most, we may be subject to misunderstanding, but not to being cheated.

4.3 Direct and indirect social signals

Sometimes information about social facts is not conveyed explicitly but in an indirect way. Here we contrast the *literal* to the *indirect* meaning of signals. According to Poggi (2007), in communicative signals of whatever modality (gesture, facial expression, gaze, posture, physical contact), the relation between signal and meaning may be either *"codified"* or "*creative*". The former case implies a stable connection in long-term memory between a specific perceivable stimulus and the corresponding belief, with a list of these signal-meaning pairs making a "lexicon" (for example a lexicon of gestures, head movements, gaze items) possibly similar to the mental lexicon of words for a verbal language. In the latter case, the signal –

meaning link is not represented once and for all, but can be deduced on the basis of systematic rules: for instance, an iconic gesture is constructed (and a meaning is drawn from it) on the basis of the similarity between shape and movements of hands and the content referred to by the gesture. This meaning, whether codified or creative, is the "literal meaning" of a signal. But when the signal is produced (and understood) in context, information coming from context may combine with that literal meaning and, through inferential processes, give rise to further, "indirect" meanings, that differ across contexts.

Some examples of indirect meanings. A is presently depressed, and her state of sadness and depression is clearly signalled by her facial expression (Cohn 2010). This is a communicative signal, but not a "social" one, because sadness is not a "social emotion" in itself (whereas, for instance, being "sorry-for" someone might be one). Yet, from her depression B might infer that A does not want to talk with B. In this case the signal of depression is an indirect social signal of interaction. Again: take a teacher who, in total good faith, overhelps her pupil, i.e., helps him to complete a task he could well complete by himself (D'Errico et al. 2010); the pupil might finally infer a negative evaluation of his own skills. This is then an *indirect informative social signal*. But take (another real example) an amateur orchestra conductor during a concert rehearsal; the concert sponsor, who is the habitual conductor of that orchestra and does not trust the amateur conductor's skills, fearing a potential insuccess, wants to convey the orchestra players they should not follow him because he is not a good conductor, and staying behind the amateur conductor he makes conducting gestures too. While the teacher's was an informative social signal, not sent on purpose, this is an *indirect communicative social signal*, since the inferences drawn by the Addressees (the players) are intended by the Sender (the sponsor).

5. Modalities of Social Signals

Humans produce Social Signals in all modalities, words, prosody and intonation, gestures (McNeill 1992, Kendon 2004), posture (Condon and Ogston 1971), head movements (Cerrato 2005), facial expression (Ekman and Friesen 1972); gaze (Argyle and Cook 1976; Kendon, 1992; Poggi, 2007) physical contact and spatial behavior (Montagu 1971; Hall 1966), and by their sequential and simultaneous combination make multimodal "discourses" (Poggi 2007a). Let us overview studies in these modalities.

5.1. Verbal and vocal features

An obvious case of social signals are words and sentences, mainly those expressing social acts, feelings and evaluations. Research in the detection of linguistic social signals includes "sentiment analysis" (see for example Wilson et al. 2005; de Rosis and Novielli 2007) and the analysis of "subjectivity" (Wilson and Hofer 2011) which, after distinguishing objective from subjective utterances, those expressing positive and negative "private states" (opinions,beliefs, sentiments, emotions, evaluations, uncertainties, speculations), describe them in terms of the state of an experiencer holding an attitude toward a target (Wiebe 1994; 2005). "Sentiment analysis" aims at recognizing the viewpoint that underlies a text, by classifying the polarity (positive/negative) of its words and sentences, possibly by means of thesauri or semantic dictionaries such as WordNet, and by measuring their frequency. A first relevant issue here is to take into account the *valence shifters*: modifiers that change the intensity of a term (intensifiers and diminishers) or its orientation (negations). It is different, of course, to say "Jane is nice" or "Jane is *very* nice" or "Jane is *not* nice". Another issue is the attribution of the mental states mentioned to its source: if I say "I like Jane", the subjective state is felt by me, while if I say "I know you like Jane" the state of liking is attributed not to me but to you: which can be detected thanks to verbs of saying or subordinate clauses. But purely syntactic or lexical cues are not sufficient to capture more subtle ways to express opinions or evaluations: the analysis of context, for example of previous sentences in a debate or an interview, is necessary to draw the right inferences (de Rosis and Novielli 2007).

The analysis of linguistic subjectivity has been used in marketing to detect customers' orientations, in persuasive natural language processing (Guerini et al., 2008) but also in dialogues to detect role distribution (Wilson and Hofer, 2011).

Another important domain of Social signal processing are the prosodic aspects of speech, that include temporal features, like pauses, vowel length, speech rhythm, articulation rate, but also acoustic features such as pitch, vocal intensity and voice quality.

The first important exploitation of signal processing techniques in this domain were Pentland's studies, that from correlations between participants' acoustic features detected activity level, influence and mirroring, that signal particular role relations and interaction outcomes. Pioneering studies in psychology (Scherer 1979; Scherer and Scherer 1981) on the acoustic cues to personality features recently gave rise to signal processing studies in which prosodic features like pitch, formants, energy and speaking rate were used to predict personality (Mohammadi et al. 2010). Following the seminal works of Sacks et al. (1974) and Duncan and Fiske (1977) in conversation analysis, which showed how turn-taking behavior is a cue to the kind of social interaction, in a discussion, automatic analysis of conversations has recently shown how the relations between turns of different speakers (their smooth alternation vs. their overlapping) can tell us something about the recognition of roles in the discussion – who is the protagonist, the attacker, the

supporter – (Vinciarelli 2007), the identification of dominant individuals (Jay-agopi et al., 2009), and of fragments of conflictual interactions.

For example, when speakers start to talk faster, the general loudness of conversation increases, and when the turns of two participants overlap, especially if the turn overlapping lasts more than average, all this tell you the conversation is becoming conflictual. Recent work in automatic detection, beside taking into account turn-taking flow, identify steady conversation periods, built on the duration of continuous slots of speech or silence, thus capturing the attitude of some participant to take the turn even when the interlocutor has not finished speaking. Results show that speech overlapping, especially if it lasts longer, clearly discriminates between conflictual and non-conflictual discussions (Pesarin et al. 2011).

5.2. Gestures

A "communicative gesture", or simply "gesture", is any movement of hands, arms or shoulder produced by a Sender to convey some meaning (Poggi 2002). On the signal side, any gesture can be analyzed in terms of a set of parameters: its handshape, location (the place over or around the Sender's body where the gesture is produced), orientation of palm and metacarp, and movement, including direction and trajectory, but also velocity, tension, repetition, fluidity (the so-called "expressivity parameters" of Hartmann et al. 2002), that generally impress emotional nuances to the gesture. Gestures are a very powerful means of expression and communication; they not only convey many types of meaning, but also contribute in the elaboration and phrasing of thought (Mc Neill 1992). Types of gestures differ in terms of various criteria.

For instance, they can be "creative" (created on the spot) versus "codified" (steadily stored in memory, like words in a lexicon). We make a creative gesture when, depicting the shape or imitating the movements of an object, we produce an "iconic" gesture, that represents meanings by reproducing their connected images. Typical codified gestures are "symbolic gestures", that convey the meaning of specific words and sentences, and have a shared verbal translation in a given culture. Gestures can also be either "motivated" (iconic or natural) or "arbitrary". A gesture is "iconic" when there is relation of similarity between form and meaning (e.g., *beating hands like wings* to mean "bird", or mimicking a cat climbing on a drain-pipe), and "natural" when the relation is one of mechanic determinism (the gesture of elation of *shaking up arms*, determined by the physiological arousal of this emotion). A gesture is "arbitrary" if you cannot guess its meaning from its form. Most "symbolic gestures" are arbitrary, since being codified in memory they can afford not being iconic.

Another criterion to distinguish gestures is a semantic one. Like all signals, gestures may convey three types of meaning (Poggi 2007a): information about the World (concrete and abstract entities and events, and their properties and relations), the Sender's Identity (sex, age, cultural roots, ethnicity, personality), and

the Sender's Mind (his/her beliefs, goals and emotions concerning ongoing discourse). For example, among symbolic Italian gestures about the World, the gesture of extended index fingers, with palms down, getting closer to each other, paraphrased as *"se l'intendono"* (they have an understanding with each other) or *"c'e' del tenero"* (they are lovers) may be viewed as a "social signal" since it concerns a social relationship, while *extended little finger up*, "thin", denoting a physical feature of a person, is not; *right fist beating on left palm*, that means "stubborn", a personality trait of not being easy to persuade, is "social". Gestures informing on the Sender's identity, like *fist raised up* (= I am communist), to claim one's belonging to a political or ideological group; or *hand on heart*, a self-presentation of one's positive moral identity, may be viewed as "social gestures". Within information on the Sender's mind, *pulling back flat hands, palms forward*, which means "I apologize", and then greeting gestures, handing something, or showing a seat, communicate the performative of a social act. *Raising a hand* to ask for the turn, or *pointing with open hand* to solicit someone to speak fulfill turn-taking functions. Among "creative" gestures, those invented on the spot and used during discourse, good candidates to be "social" gestures are those pointed out by Bavelas (2007): "interactive gestures" (for instance, pointing at the Interlocutor to acknowledge his suggestion), and "collaborative gestures" (like indicating the fold of a virtual origami depicted by your interlocutor in the air): they are "a dialogic event, created by the joint actions of the participants" (Bavelas 2007: 292). But the "social" information contained in a gesture need not necessarily lie in its overall meaning, but also simply in some of its parameters. Suppose I am giving directions to my husband about where to find a tobacco shop, but I am angry at him for his smoking too much: the direction of my gesture tells him where the tobacconist is, but its jerky movement might tell him my anger; the handshape and direction of movement inform about the world, but the expressive parameter of velocity and non-fluidity is a "social signal" of a social emotion.

One more case of a "social gesture". When a speaker makes gestures to illustrate his narrative, the interlocutor sometimes produces the same gestures of the narrator or different ones that anticipate ongoing narration, to show he is following and even predicting subsequent development. These are simply iconic gestures, concerning shapes or movements, but their use is "social", since by them the interlocutor gives a backchannel, thus helping social interaction.

5.3 Head movements

Head movements have been studied in a marginal way compared to facial expression and gestures (Heylen 2005), although they have lots of semantic, narrative and discursive functions in the process of communication. McClave (2000) analyzed head movements in relation to the lateral movement and to the orientation, recognizing, for the former, functions of intensification, inclusion and repre-

sentation of uncertainty, and for the latter one of locating referents in an abstract space. According to Kendon (2002) the head shake is anticipated or postponed to negation, for rhetorical purposes. Dittmann (1968), Hadar (1983) and Cerrato (2005) focused on the interpersonal function represented by the synchrony voice-nod, that corresponds to the wish of the listener to speak or the wish of the speaker for feedback (Dittman 1968; Cerrato 2005), and measured the duration of the nod in relation to speech rate, while Boholm and Allwood (2009) considered the functions of head nod and head shake repetition. Heylen (2005) and Cerrato (2005; 2007) consider the nod as a backchannel signal that indicates acceptance, agreement and submission; maybe for this reason, in the context of power and gender communication, it is more frequent for women than men and for low than high status people (Hegen-Larsen et al. 2004). Cerrato (2005) pointed out the most frequent head nod functions (giving continuation, giving agreement, request feedback and focus) and showed that a nod of "giving continuation" (0.40 msec) is briefer that one "giving acceptance" (0.60msec), while Hadar at al. (1983) classified the "synchrony" movements as having low amplitude and short duration compared to "anticipation" movements, of low frequency and large amplitude. Beside analyzing the head nod from the point of view of the signal, recent research emphasizes the effects of nodding in increasing agreement (Wells and Petty 1980) and changing attitude. Briñol and Petty (2003) demonstrated that if one nods, as opposed to shakes his head, while another speaker is delivering a persuasive message, the headnod brings about a more persuasive effect than a headshake, since it increases confidence in oneself, becoming an internal cue to the validity of the message heard (s*elf-validation hypothesis*).

Poggi, D'Errico, Vincze (2010) define a nod as a vertical head movement in which the head, after a slight tilt up, bends downward and then goes back to its starting point. It is a holophrastic signal, since it conveys the meaning not of a single word but of a whole communicative act, including performative and propositional content (Poggi 2007a; 2008), that can be paraphrased, depending on the context, as "I confirm", "I agree", "I thank you" or other. This means it is a polysemic signal, i.e., one corresponding to two or more meanings, that are not completely unrelated but share some common semantic element.

Based on the analysis of 150 nods from the "Canal 9", a corpus of political debates available on the portal of the European Network of Excellence SSPNet (Social Signal Processing Network), a typology of nods was outlined, with each type characterized by subtle cues in other modalities (like parallel smile or blink behaviours) and by the context of production.

Some nods are produced by the present Speaker, some by the Addresse and some by a Third Listener, a simple bystander to whom the present speaker is not addressing. For the Interlocutor's nods those produced while the present Speaker is talking are nods of backchannel, while for those after the Speaker has finished talking (cases A) the meaning depends on the speech act performed by the Speaker in the previous turn. So, like for *yes,* a *nod* following a *yes/no* question

counts as a confirmation of the Speaker's hypothesis, one following an assessment or a proposal conveys agreement or approval; it is a permission after a permission request, submission after an order, *acknowledgement* or *thanks* after a prosocial act like an offer, and finally conveys a *back-agreement* (when the Listener agrees with what he had previously thought) or a *processing* nod (someting like scanning the steps of one's reasoning). Also the Third Listener's nods convey a *confirmation* after an information, and *agreement* after an evaluative opinion.

The Speaker's nods, performed while holding the turn, include two broad families, with two semantic cores, respectively, of importance and of confirmation. Within the former, we may nod to emphasize what we are saying (*emphasis*), meaning "this part of my sentence or discourse is particularly important": the head goes goes up and down but also slightly forward, in correspondence with a stressed syllable and gaze toward the Interlocutor. Particular cases of emphasis are when we nod in correspondence of all the stressed syllables of our sentence (*baton*), and while listing (*list*), to convey we are mentioning items of the same list. Other nods of the Speaker are linked to confirmation. A nod while looking at the Interlocutor and frowning, or with oblique head, slightly tilted sidewise (*interrogative nod*) is a request for confirmation, just as a *"yes?"* with interrogative intonation, and can be used also as a rhetorical question (*Rhetorical interrogative nod*). Finally, a nod with an interrogative expression may ask confirmation that the other is following (*backchannel request*).

5.4 Gaze

Beside studies concerning vision (Yarbus 1967) gaze has been investigated, in psychology and communication research, as to its role in face-to-face interaction (Kendon 1967; Argyle and Cook 1976; Goodwin 1981; Bavelas 2000; Allwood et al. 2005), in narration and persuasion (Poggi et al. 2000; Heylen 2005; Poggi and Vincze 2008) and as to evolutionary differences in gaze between humans and apes (Tomasello 2007).

5.4.1 Gaze and social attention

Most studies on gaze focus on the genuinely social and interactive functions of gaze direction. Gazing at a person signals attention to the other, but also solicits shared attention (Argyle and Cook 1976; Trevarthen 1979). When a child wants to attract his mother's attention to something, he alternatively gazes at her and at his object of interest. That autistic children tend not to gaze to their interlocutor has

led to think that mutual gaze is linked to the construction of the Theory of Mind (Baron-Cohen 1991) the capacity to imagine the other's mental states.

If gazing at another is the core of social attention, specific uses of gaze direction regulate face to face interaction, working as an important set of signals for turn-taking and backchannel (Rossano 2005): looking at the interlocutor asks him to follow or to provide feedback; averting gaze tells you are thinking, trying to retrieve words, hence work to keep the floor; and if you are the interlocutor, gazing at the speaker assures about your interest and attention.

These findings gave rise to gaze tracking studies to detect mutual attention, interaction regulation, and early symptoms of autism (Boraston and Blakemore 2007).

In the field of Embodied Agents, the role of gaze direction, especially if compared to face and body direction, has been stressed as a sign of interest (Peters et al. 2005), and its use in face to face interaction and backchannel has been simulated in Virtual Agents (Cassell 2000; Bevacqua et al. 2007).

5.4.2 Lexicon and parameters of Gaze

Beside establishing shared attention and the setting for interaction, gaze conveys specific meanings. Eibl-Eibesfeldt (1972) and Ekman (1979) analyzed some conversational, emotional and syntactic functions of the eyebrows; Sign Language scholars (Baker-Schenk 1985) studied the syntactic and semantic role of gaze in ASL (American Sign Language) and LIS (Italian Sign Language). For the Hearing (non-deaf) people, the repertoire of gaze meanings was investigated by Kreidlin's "Oculesics" (2002), and Poggi (2007) proposed to write a lexicon of gaze, arguing it is a communicative system as complex and sophisticated as facial expression or gesture can be. In gaze, the signals – the perceivable stimuli an interlocutor can see and interpret by attributing them some meaning – are morphological features and muscular actions exhibited in the eye region, that includes *eyebrows*, *eyelids*, *eyelashes*, *eyes* and *eye-sockets*. The meanings are imagistic or conceptual representations linked to those signals.

The parameters proposed by Poggi (2007a) to analyze the signals of gaze are:
1. movements of the eyebrows (e.g., eyebrow frowning means worry or concentration, eyebrow raising, perplexity or surprise)
2. position, tension and movement of the eyelids (in hate one lowers upper eyelids and raises lower eyelids with tension; in boredom upper eyelids are lowered but relaxed)
3. various aspects of the eyes: humidity (bright eyes in joy or enthusiasm), reddening (bloodshot eyes in rage), pupil dilation (a cue to sexual arousal); focusing (staring out into space while thinking), direction of the iris with respect to Speaker's head direction and to Interlocutor (which allows a deictic use of eyes)

4. size of eye sockets (expressing tiredness)
5. duration of movements (a defying gaze focuses longer over the other's eyes).

On the meaning side (Poggi 2007a), fragments of a lexicon of gaze were described, within which several uses of gaze convey "social" meanings. Ethnicity for instance is conveyed by *eyelid shape*; *bright eyes* reveal aspects of personality. Some gaze items communicate the performative of our sentence (*you stare at the Interlocutor* to request for attention), others, turn-taking moves (*you gaze at present Speaker* to take the floor) and feedback (*frowning* expresses incomprehension or disagreement, raising eyebrows with half-open eyes, perplexity). The meanings of specific gaze signals have been investigated by empirical and observational studies. In a study on the degrees of aperture of upper eyelids (wide-open, half-open, half-closed) and lower eyelids (lowered, default, raised) it was found that the *half-open* upper eyelids convey de-activation, referred to a physical (*sleepy, exhausted*), cognitive (*how boring*) or emotional state (*sad, I am sorry*, *I couldn't care less*), but the combination with *raised lower eyelids* adds a component of effort (*I am trying to remember*, *I am about to cry*) (Poggi, D'Errico, Spagnolo 2010).

Within eye-closing behaviors, the blink, a rapid closing of the eyes that in general has a bare physiological function of keeping standard eye humidity, may convey agreement, and accompanying or substitute a nod (Vincze and Poggi 2010). Yet, blink rate has also been found to be a cue to deception: people while deceiving are concentrated and do not blink, but when deceipt is over they blink more frequently to compensate (Leal and Vrij 2008).

The wink instead, a rapid asymmetrical closing of a single eye, conveys allusion and complicity. It addresses only one specific addressee, with whom the Sender feels syntonization and complicity, while excluding others: it then appear furtive and allusive, implying inclusion of Sender and Addresse in the same group, and exclusion of a third party (Vincze and Poggi 2010). Sometimes, mainly if accompanied by a smile, it conveys *playful complicity* and can be exhibited also or mainly to the third party, thus making it clear that the Sender is just kidding. The *warning* wink, instead, that warns a confederate (the Addressee) about some enemy, must exclude the enemy and hence be concealed from him, to be perceived only by the confederate.

5.5 Posture

Postures are complex and multifaced social signals expressing interpersonal attitude, relations and emotions.

In their description it is necessary to take into account various parameters: arms (open, closed, on hips), trunk (backward, forward, and lateral), head (downward, upward and lateral), and legs (open, crossed, extended).

Concerning their meaning, postures have been studied by Meharabian (1972) and Argyle (1975) mainly in relation to two main dimensions: status and affiliation. High status is expressed through space, by enlarging the body (rising up to full height, wide legs) and through a relaxed body (leaning, sitting and asymmetric postures). In this sense, accoding to Argyle, posture corresponds to a reflection of established hierarchy: lower status people tend to be more tense, nervous and aggressive because they have to achieve material and symbolic resources.

From a relational point of view Scheflen (1964) and Kendon (1970) analyzed the similarity and orientation of posture: when two interactants share the same centre of attention, posture similarity seems to be a reliable signal of quality of relation, and it even induces more positive relations.

Meharabian (1972) identified postures of attraction and intimacy describing proximity and forward inclination, gaze and orientation toward the interlocutor. He observed that women tend to be more intimate than men; this tendency seems to be correlated to the patterns of low status persons, confirming that gender behaviors and signals are akin to status signals (D'Errico 2006).

Posture, when dynamically considered, has a relevant function in the management of turn taking: posture shift is correlated with topic shift (Condon and Ogston 1971) and with a "situational" change, for example in a temporary change of rights and obligations between the interactants (Blom and Gumperz; 1972), and they are more frequent at the starts of turns (48%) independent on the discourse structure (Cassell et al. 2001).

Finally, emotions are expressed by postures. Lowered shoulders, for example, signal depression (Tomkins 1962; Badler et al. 1999): "cognitive" emotions like interest and boredom are clearly identified by Bull (1987) who described the bored posture as head downward or left-rightward (leaning on one hand) and extended legs. In shame one lowers head, while in pride head is raised and bust erected (see below).

According to Kleinsmith and Berthouze (2007), posture is a very reliable cue to affect: considering nine categories of particular emotions (angry, confused, fear, happy, interest, relaxed, sad, startled and surprised) they found that, in particular, extension of the body (lateral, frontal and vertical), body torsion, inclination of the head and shoulders in 70% of cases allow to assess the classical dimensions of emotions of valence, arousal, potency and avoidance.

5.6 Proxemics and Touch

Other important social signals can be found in proxemics (Hall 1968), physical contact, and posture. In his seminal work, Hall (1968) introduced the notion of

Proxemics, the set of rules that regulate the use of space and distance between people. He found that people keep different distances with their interlocutors in their face to face interaction, depending on the kind of social relationship they entertain with them. He distinguished intimate distance (5-10 cm.) from personal (45-120 cm.) from social (120-360cm) from public distance (360-750cm), but he also found out that the distance considered acceptable for these different face to face interactions is highly determined by culture. People from Mediterranean and African cultures, for example, compared to English or Scandinavian people, tend to speak so close to each other as to sense each other's smell, and often tend to touch each other while talking. Since people tend to conform to these rules, their spatial behavior can be taken both as a communicative social signal of the social relationship they want to entertain with the interlocutor, and as an informative signal of their cultural roots.

Strictly connected with spatial behavior is physical contact between interactants. "Haptic" communication concerns the signals perceived through the sense of touch. One of the first to develop in humans, this sense provides an important route of communication between mother and child and the basis for a strong attachment bond (Bowlby 1969), and later in adult life being touched by other accepetd people or by oneself gives a person a sense of reassurance (Montagu 1971). In this, touch may be seen as a "social signal" par excellence.

Within the acts of touch performed by a person on another, some are not aimed to communicate but to grasp (e.g., grabbing the arm of a thief that has just stolen your videocamera), to sense (a blind touching a person to sense who he is), or to feel (like in erotic intercourse). But in other cases, touch is communicative (Kreidlin 2003), and it is possible to find out a lexicon – a set of correspondence rules between specific acts of touch and their meanings – and a "phonology" ("haptology") – a set of parameters of the act of touch (Poggi 2007). In fact, depending on the way one touches the other and the touching and touched body part, different acts of touch convey different meanings (a slap tells you something very different form a caress), and various communicative acts (request and offer of help and of affect, proposal, sharing), hence establishing various kinds of social relationships with the addresse: affiliative, friendly, protective, aggressive and so forth. Moreover, touch signals are subject to specific norms of use, varying across cultures, as to who may touch whom where, based on their social relations. Also in this case, then, whose and which part of the body is touching and touched may work as communicative and or informative signals.

6. Social facts and their signals

We have defined as "social" the signals concerning "social facts", namely *social interactions, social attitudes, social relations and social emotions*. Let us ex-

plore these contents and the social signals that inform or communicate about them.

6.1 Social interaction

A social interaction is an event in which two or more agents perform reciprocal social actions, that is, actions in which the goal of one participant is directed to the other by considering him as an autonomous agent, one regulated by one's own goals. A football game, a surgery operation, a string quartet, a fight, a sexual intercourse, a school class are social interactions. But since, as demonstrated by Nass (19) also computers are seen as "social actors", also a dialogue between an Embodied Agent and a User, or one between two robots are fit the definition. Generally social interactions are or require communication; all require synchronization, i.e. mutual reactions between interaction participants, and negotiation of the participants' roles.

Some typical social signals exchanged during a communicative interaction are those for turn-taking and backchannel. The turn taking system is a set of rules to state who is to speak, and compliance to it is conveyed by nonverbal signals: you may ask for turn by handraising, mouth opening, gaze direction, variation of vocal intensity (Duncan and Fiske 1977; Goodwin 1981; Thòrisson 2002; Ahlsen et al. 2005). But the exploitation or even the violation of turn-taking rules is by itself a social signal: turn interruption may be an informative or communicative signal of aggressiveness, turn overlapping an informative signal of a competitive interaction. Yet, as all signals also these must be interpreted while taking other elements into account: if you know the one who interrupts is a very close friend of the interrupted, he might be simply completing the other's sentence, thus giving a signal of high syntonization.

Another set of behaviors that smooth interaction are backchannel signals, through which the interlocutor communicates to the present speaker if he is listening, following, understanding (Yngve 1979; Allwood et al.1992), possibly believing, finding interesting, and agreeing (Poggi, 2007; Bevacqua, 2009), by making use of hesitations, interjections, fillers, affect bursts (Jucker 1993; Bazzanella 1994; James 1974; Poggi 2008; Schröder 2003; Schröder et al. 2006) head movements (Heylen 2005) and smiles (Goodwin 1981; Bavelas 1992; Chovil 1992). But also in this case, giving backchannel is not only telling the other if you are following: it may be in itself an indirect signal that you accept the other, you are empathic with him or her: you care.

In group interaction, the interactants come to assume spontaneous or institutionalized roles that are functional to group functioning and to pursuing the group's goals. These roles can be reflected by the verbal messages exchanged during interaction. According to Benne and Sheats (1948), based on the particular statements they tend to use, participants can be attributed the functional roles of *harmonizer*, *encouraging*, *compromiser*, correlated to the so called group task

roles of *elaborator*, *coordinator* and *orienter*. In this interactional framework, even if these authors do not indicate any normative duties for the achievement of the group goals, they identify also negative functional roles such as *dominator*, *aggressor* and *recognition seeker*. As mentioned above, work is presently being done in role automatic detection.

6.2 Social attitudes

A social attitude has been defined in classical Social Psychology as the tendency of a person to behave in a certain way toward another person or a group. Social attitudes include cognitive elements like beliefs, evaluations, opinions, but also emotions, that all determine and are determined by preferences and intentions (Fishbein and Ajzen 1975). Here we overview some studies on the signals used to persuade and those to convey agreement.

6.2.1 Persuasion

Persuasion is a communicative action aimed at changing people's attitudes, that is, at influencing their tendency to action by changing their opinions: we persuade as we influence another to do or not to do something by inducing him to conclude that what we propose is good for him. Since classical rhetoric on (Aristotle, 360 B.C.; Cicero, 40 B.C.; Quintilian, 95), the study of persuasion has been a major topic, in social psychology and media studies (Petty and Cacioppo 1986; Fishbein and Ajzen 1975), linguistics, argumentation (Perelman and Olbrechts Tyteca 1969; Toulmin 1958; van Eemeren and Grootendorst 1992), and cognitive science (Castelfranchi and Guerini 2007; de Rosis et al. 2004, Miceli et al. 2006).

In the last decade Fogg (2002), investigating the role of computers as persuasive social actors, opened the field of *Captology* (acronym of Computer As Persuasive Technology), based on the assertion that also technologies persuade by giving a variety of social cues that elicit social responses from their human users. Fogg applied powerful persuasive strategies to human-computer interaction by using psychological cues based on attractiveness, similarity and reciprocation principles, and he found many communalities between persuasive technologies and human-human persuasion.

6.2.1.1 Persuasion as influence over the other's goals

In the model we adopt (Poggi 2005), a persuader A aims at influencing a persuadee B, i.e., at increasing or decreasing the likeliness for B to pursue some goal

GA proposed by A. To pursue GA, B must believe it is a valuable goal, because it is a means for some other goal GB that B already has, and considers valuable and/or because it makes B feel some positive emotion or prevents some negative one – and emotions have a high motivating power because they trigger goals (Miceli et al. 2006). Among other forms of influence – from education to threat and promise, from manipulation to the use of force – persuasion is characterized by three features: 1. communication: in trying to induce B to pursue GA, A makes clear to B he wants to do so; 2. freedom: A leaves B free of pursuing GA or not (thus differing from threat); 3. disinterest: A tries to convince B that GA is in the interest of B since it is a means for some goal GB that B has.

To persuade B, A can use the strategies highlighted by Aristotle (360 B.C.): *logos* (the logical arguments that support the desirability of GA and the means-end link between GA and GB); *pathos* (the positive emotions B might feel, or the negative he might avoid by achieving GA); and *ethos*: in Aristotle's terms, the character of the Persuader; in our terms, *"ethos-competence"*, A's intellectual credibility, his having the skills necessary for goal choice and planning, and *"ethos-benevolence"*, his moral reliability: the fact that A does not want to hurt or cheat B, or to act in his own concern.

We persuade by producing multimodal persuasive discourses, i.e. sequential and/or simultaneous combinations of communicative acts in various modalities. For example, in a pre-election discourse, all the politician's sentences, gestures, face and body movements, at various levels of awareness, through their direct and indirect meanings pursue *logos*, *ethos* or *pathos* strategies, trying to convey "I ask you to vote for me". But in this case, is only the combination of all signals "persuasive", or can we say that some words, or some gestures, intonations, gaze items, are in themselves persuasive?

6.2.1.2 Persuasive gestures, persuasive gaze

Recent work (Poggi and Pelachaud 2008; Poggi and Vincze 2009), analyzing multimodal communication in political persuasive discourses by Italian and French politicians, found out that only rarely are some words, gestures or gaze items "persuasive" by their very meaning – for example, a gesture of incitation, or a word of encouragement; rather, we may call "persuasive" some some uses of gaze, some gestures or sometimes simply some parameters of their expressivity, that convey "persuasive information", i.e., information that is salient in persuasive discourse. First, information relevant to pursue a logos strategy:
  1. *Importance* of the goal proposed by the persuader, borne by gestures or gaze items conveying performatives of incitation or request for attention, like beats or eyebrow raisings that convey emphasis, but also by the irregularity or discontinuity of gesture movements, that capture attention.

2. *Evaluation*. Persuading implies inducing positive evaluations of objects, persons, events, so all words, gestures, and other signals mentioning evaluations have a potentially persuasive import.

3. *Certainty*. Persuading implies convincing, i.e. making someone believe, with a high degree of certainty, what goals are worth to pursue (their value, importance) and how to pursue them (means-end relationships). Gesture with a meaning of high certainty, like the *ring* (thumb and index making a circular shape) that means precision and commitment to what one is saying, or a *small frown*, that means "I am serious, not kidding", may be persuasive. Yet, one may also indirectly convey *certainty* by pursuing an *ethos* strategy, e.g. showing self-confident about what one is saying by exhibiting an *easy posture* or a *fluid speech rhythm*.

Other meanings that bear on an *ethos* strategy are:

4. *Sender's benevolence and competence*. To be persuaded we do not only evaluate the goals proposed or the means to achieve them, but the persuader: the Sender's *ethos*, that encompasses his *benevolence* – his taking care of our goals – and *competence* – his having the skills to do so. A gesture driven by an *ethos benevolence* strategy, namely, showing one's moral reliability, quite frequent in political communication, is *hand on heart* (Serenari 2003), generally meaning "I am noble, fair, reliable". A gesture evoking *ethos competence* strategy is one by the Italian politician Silvio Berlusconi who, in talking of quite technical things concerning taxes, *rotates his right hand curve open, palm to left, rightward twice*, meaning that he is passing over such technicalities, possibly difficult for the audience; his relaxed curve movement indirectly communicates how smart he is, talking of such difficult things easily and unconstrained. This projects an image of competence.

When exploiting a *pathos* strategy, the persuader mentions or evokes emotions:

5. *Emotions*: expressing an emotion may induce it by contagion and hence trigger the desired goal. The Italian politician Romano Prodi, while talking about his country, *moves his forearm with short and jerky movements of high power and velocity* to convey his pride of being Italian and transmit it to the audience, to induce the goal of voting for him.

Based on these principles, the persuasive use of gesture and gaze was investigated in some fragments of pre-electoral interviews in Italy in 1994 and 2006 (Achille Occhetto and Romano Prodi) and in France in 2007 (Ségolène Royal). In the annotation scheme used for the analysis, beside a transcription of the verbal context, each gesture or gaze item was described in terms of its parameters and a verbal paraphrase of its literal and possibly indirect meaning was classified in terms of a semantic taxonomy (Information on the World, the Sender's Identity and the Sender's Mind, Poggi 2007a), and in terms of the persuasive strategy pursued: *logos*, *pathos*, *ethos benevolence*, or *ethos competence*.

For example, Ségolène Royal, while talking of the top managers who spoil the enterprises like Mr. Forgeat, *looks at the Interviewer* Arlette Chabot, with a *fixed*

gaze which means "I am severe, I do not let you avert gaze": this conveys information about Royal's personality, her being serious and determined, aimed at a strategy of *ethos competence*, possibly indirectly implying she is one who struggles against injustice: one more information on her *ethos*, but on the moral side, *benevolence*. Then Royal, while *leaning her head on the left*, *looks at the Interviewer obliquely* and *with half-closed eyelids*, an expression of anger and indignation: information about her emotion, which she possibly wants to induce in the audience, thus pursuing a *pathos* strategy.

By computing gesture and gaze items in the fragments analyzed, you can single out patterns of persuasive strategies in the subject observed. From the studies above it resulted that the Italian politician Achille Occhetto has a higher percentage of persuasive gestures than Prodi out of the total of communicative gestures (Occhetto 20 out of 24, 83%, Prodi 34 out of 49, 69%), also because Prodi sometimes uses iconic gestures, that convey Information on the World and have no persuasive import except for some in the expressivity parameters. Further, Occhetto relies much more on *pathos* than on *logos* gestures (30% vs. 5%) while Prodi uses the two strategies in a more balanced way, but with a preference for *logos* (23% vs. 12%). In both most gestures (65%) pursue an *ethos* strategy, and both tend to project an image of competence more than one of benevolence, but more so for Prodi (50% vs. 15%) than for Occhetto (45% vs. 20%).

The differences in the patterns of persuasive gesture and gaze of the politicians under analysis are coherent not only with the argumentative structure of the fragments analysed, but also with the politicians' general persuasive style, as well as with their political history. For example, since in the fragment analyzed Occhetto is attacking his opponent Berlusconi from an ethical point of view, he aims to project an ethically valuable image of himself; Prodi instead is describing his program and thus wants to project the image of one able to carry it on in an effective way. In terms of political strategies, compared to Prodi, a centre-left politician coming from a former catholic party, the communist Occhetto has a higher need to show his image of benevolence.

6.2.2 Signals of agreement

When persuasion, our attempt to change the other's opinion and tendency to action, succeeds, the other finally agrees with us. But what is agreement, and what are its signals? How can one catch not only clear-cut but also subtle cases of agreement and disagreement, expressed, directly or indirectly, in words, gesture, intonation (Ogden 2006), face, gaze, head movements, posture?

From a cognitive and social point of view, agreement occurs when there is a relation of identity, similarity or congruence between the mental states of two or more persons. Yet, we may not agree about "factual" beliefs, i.e., about simply informative speech acts (I cannot agree after a question like *"Did Napoleon die in*

1821?" nor after a statement like *"Napoleon died in 1821"*, unless someone challenges this as not a factual belief but a questionable statement), but only about speech acts like a proposal, an assessment (i.e., the expression of some evaluation) or an opinion (for instance, after a sentence like *"I think that Napoleon was a great man"* or *"I propose that all teachers give a home assignment about Napoleon"*).

An opinion is a "subjective" belief, that is, one we know is not necessarily shared, and have no empirical evidence for, firstly because it is not about something that can be perceived by senses. It is a belief we draw concerning some entity or event by considering it from our particular "point of view", somehow determined by our beliefs and goals (Poggi et al. 2010a). And since this opinion may be our point of view not only about facts, but also about goals or evaluation, we can also agree about another's (opinion concerning a) proposal or assessment.

An evaluation is a subjective belief concerning how much some entity or event has or gives the power to achieve some goal, and it may typically be the object of an opinion. A proposal is a requestive speech act (one asking to pursue some goal), in which 1. the goal "proposed" is in the interest also of the Addressee, 2. the Sender does not intend to make use of power over the Addressee, who is thus free to pursue the proposed goal or not; 3. acceptance implies that the Addressee approves the proposal, i.e. s/he also believes it is functional to her/his goals too.

In conclusion, agreement is an internal mental state of some agent B: B's assumption about his having the same opinion as another agent A. This assumption may be communicated by B to A or to others through an "expression of agreement", i.e. a simple or complex social communicative act, composed by verbal and/or body signals.

An observational study on the political debates in the "Canal 9" corpus (Poggi et al. 2010a) found out that during a debate a participant may express agreement in at least three ways:

1. by *discourse*: one or more sentences that express an opinion similar or congruent with one previously expressed by another participant;
2. by verbal expressions containing specific words, *verbal agreement markers*, like *ok*, I *agree, oui* or others:
3. by *body agreement markers* like *nods*, *smiles*, *gestures* or *gaze signals*.

Agreement is expressed *by discourse* when one or more sentences of a participant either literally repeat or rephrase an opinion expressed earlier by another participant. But it can also be expressed only by *agreement markers*: words or constructions with a semantic content of agreement, like (in French) *d'accord* (ok), *oui* (yes), *vous avez absolument raison* (you are absolutely right), *nous sommes d'accord* (we agree), *je vous rejoins* (I join you [in believing x]), *effectivement* (in fact), *(bien) évidemment* (obviously), *tout-à-fait* (absolutely).

A frequent *agreement marker* is *"d'accord"* (= ok; I agree), which though, to mean agreement, must be used in a performative way, that is, as meant by the same person who is speaking, not as another's reported agreement (e.g., *"(Je suis) d'accord"* as opposed *"Il est d'accord"*). In other cases, *d'accord* counts more as

an acknowledgement of what another Speaker has just said: a backchannel signal rather than real agreement.

Typical signals of agreement are *smiles*, *eyebrow raisings* and *nods* (see Bousmalis et al. 2009 for a survey), but also some gestures: for instance, *moving right hand forward*, as if presenting and showing what the other is saying as a good example of what you also think; or, again, *raising hands with open palms up*, that means "this is evident", while another is speaking, to underline one totally agrees with what he is saying. Eye and mouth behaviours may convey agreement too. Within gaze signals, the *closing of the eyelids* is relevant: when agreeing with the present Speaker, the Interlocutor's nods are often accompanied by *rapid blinks*, or by *wide open eyes*, usually with *raised eyebrows*, that emphasize the extent to which one agrees with the other: eyelid behaviour as a nod intensifier. Yet, *blinks* as cues of agreement can appear also by themselves, without being accompanied by a *nod*. As to mouth behavior, agreement is often conveyed by *smiling*, but sometimes also by lip pressing which, if accompanying a nod, emphasizes agreement.

From a semantic point of view, these signals may convey True, Indirect or Apparent agreement. Sometimes, in fact, a bodily or verbal expression of agreement can be taken at face value (*true agreement*), in either stronger or weaker forms (*enhanced* and *unwilling agreement*). We talk of *enhanced agreement* when people do not simply communicate they share the other's opinion, but provide additional arguments or emphasize their verbal agreement by *smile* or *eyebrow raising*. One may express *unwilling agreement*, instead, by admitting the other is right, but only by nonverbal signals (e.g. by *stepping back* or *lowering head*) to keep a low level of commitment and minimize the self-humiliation implied in acknowledging one was wrong. On the other hand, sometimes agreement is expressed indirectly: no apparent agreement marker is produced, but substantive agreement can be inferred from the global meaning of what is literally communicated by words or body signals. Other times, finally, agreement is only local, partial or hypocritical, while it actually masks indirect disagreement (*apparent agreement*): this is the *"Yes, but...."* strategy, that makes use of various stratagems, like uttering an agreement marker (e.g., the French *effectivement* = in fact) with a *suspensive intonation* that announces reversing the polarity from agreement to disagreement, or using expressions (like *je dois dire* = I must say) that limit the scope of one's agreement.

6 .3 Social relationships

A social relationship is a relation of interdependency of goals between two or more persons: one in which the pursuit, achievement or thwarting of a goal of one determines or is determined by the pursuit, achievement or thwarting of a goal of the other (Lewin 1947; Festinger 1950; Byrne 1971).

Types of social relationship have been distinguished in terms of criteria like public vs. private, cooperation vs. competition, presence vs. absence of sexual relations, social-emotional support oriented vs. task oriented (Berscheid and Reiss 1997). Within group relationships, some studies concern the definition and description of mechanisms of power, dominance, and leverage (Castelfranchi 1990; Lewis 2000), their change and enhancement through alliance, influence and reputation (Conte and Paolucci 2002), their interaction with gender relations, and the nature of leadership.

Typical signals revealing social relationships include the manner of greeting (saying *hello* signals the wish for a positive social relation, saluting signals belonging to a specific group like the army), the manner of conversing (e.g., formal allocutives like addressing someone as *professor* to signal submission), mimicry and the display of typical group behaviour (signalling the existence or wish of a positive social relation), spatial positioning and gaze direction (e.g., making a circle around a certain person, or gazing at her more frequently, indicates her as the group leader: Argyle and Cook 1976), physical contact (that one touches another, and the way one does, may indicate affective or power relations (Hall 1966; Poggi 2007a).

For group relationships, both deliberate and unaware signals, like dress or haircut, vs. regional accent and mimicry, reveal felt or wished group belonging. Emblems on clothes, elaborate hair, or objects like a crown or a huge desk in the office reveal status or role in the group (Hinde 1977; Halliday 1983).

To provide a blow-up on the complexity of social signals in this domain, let us focus on the relation of dominance.

6.3.1 Dominance and its signals

The notion of *dominance* reflects different research approaches and is sometimes confused with notions like *status* or *power*. In the sociological perspective, *status* is a hierarchical position in a group or organization, determined by native (e.g., gender or ethnicity) or gained characteristics (e.g., skill in work). In social psychology, according to the *expectation states theory* (Ridgeway 2001) at the interpersonal level people form *expectations of status*, evaluative beliefs about positive or negative competences associated to this nominal feature, and at the personal level they have *expectations of performance*, which anticipate the contribution needed for a specific task. In the *social identity theory* (Tajfel 1978), the awareness of belonging to a social group is a central part of the self concept, with associated emotional, motivational, behavioural responses; so people tend to evaluate the *stability* and *legitimacy* of status differences to decide what cognitive strategy is useful in their condition: re-categorization, social creativity, individual or collective mobility across the hierarchy (Tajfel and Turner 1986).

Power is defined as "the ability to influence or to control other persons or groups" (Ellyson and Dovidio 1985). Status may well be a condition for power in this sense, but does not necessarily imply attitude change and control, and it is focused not on personal competence but on a nominal or structural position in a social group or institution.

Dominance might be seen as a combination of status and power since it is defined as "ability to influence or control others", but it also involves *groupness*, since it concerns power relationships within a relatively enduring social organization" (Ellyson and Dovidio 1985). As to its roots, some authors view dominance as a personality trait (Pratto et al. 1994), stressing its being a steady feature of an individual, others propose a situational view: dominance as gained from time to time depending on the context (Aries et al. 1983; Burgoon and Dunbar 2000; Pratto at al. 1994).

In recent literature, for the *social dominance theory* (Pratto et al. 1994) one possible explanation of discrimination phenomena is the psychological construct of *social dominance orientation* (SDO), i.e. the personal preference for hierarchical relationships between social groups. The degree of social dominance is determined by group membership because members of more powerful groups are more dominant than less powerful ones (e.g., men more dominant than women); further, SDO is a way to maintain social hierarchies, since people with high levels of social dominance tend to legitimate racism, nationalism and conservatism.

The *dyadic power theory* (Dunbar et al. 2008) proposes the notion of *interpersonal dominance* as "a relationally-based communication strategy dependent on the context and motives of the individuals involved" (Burgoon and Dunbar 2000), viewing dominance as a dynamic combination of personal and contextual characteristics, based on a relational model, according to which the influence or control of powerful individuals depends on the submission or acquiescence of others. From this perspective much research has focused on the verbal and non verbal indicators of dominance (for ample reviews see Ridgeway 1987; Argyle 1988; Dunbar and Burgoon 2005; Dunbar et al. 2008).

Signals of dominance in various modalities have been explored. Within studies on gaze, Keating (1986) demonstrated that in western cultures lowered eyebrows are perceived as a strong signal of dominance. Argyle (1988) pointed out that the dominant person gazes less and during interaction reduces the amount of gaze and breaks mutual gaze first. Yet, in close relationships the dominant person has a more expressive face, he looks more than the less dominant and shows higher *visual dominance*, i.e. higher looking while speaking than while listening (Ellyson and Dovidio, 1985; Dunbar and Burgoon 2005). As to hand movements, the dominant person uses more gestures, and within them, more illustrators than adaptors (Dunbar and Burgoon 2005). Since illustrators are the gestures that accompany speech by adding information of an imagistic kind, while adaptors (Ekman and Friesen 1979) are hand movements onto one's own body or objects performed by the speaker to feel more at ease or to reassure oneself, a lower use of adaptors

gives an impression of relaxation and confidence. Posture and spatial behaviour are salient in the expression of pride (Tracy and Robins 2007), where expanded postures are typical especially in males (Cashdan 1998). In vocal behaviour, dominance passes through speech intensity, tempo and pitch (Ridgeway 1987; Gregory and Webster 1996), but also through turn taking management (Jayagopi et al. 2009): perception of dominance is strictly connected to amount of speaking (Stein and Heller 1979), topic introduction (Brooke and Ng 1986), frequency and maintenance of turns, and interruptions (Ng and Bradac 1986).

6.3.2 Blatant and subtle dominance strategies

Starting from a definition of dominance as "the fact that an Agent has more power that another" (not necessarily as a stable trait, but also in a specific context), Poggi and D'Errico (2010a) analyzed signals of dominance in political debates. They singled out various "dominance strategies", sets of behaviours that all bear a message of dominance, "I have more power than you", but each conveying, in one or more modalities, directly or indirectly, a specific message, attitude or image. They distinguish blatant from subtle strategies. Among the former, one is *aggressiveness*, that includes:

    a. *imperiousness*, expressed by requestive communicative acts and deontic words like *mus*t, *ought to*, *necessarily*, hence conveying the message "I give you commands, → I can afford to do so → I have power over you"

    b. *judgement*, expressed by insults and evaluative words like *praiseworthy* of *filthy*, frowning and facial expressions of severity, that tells "I can judge you, so I have power over you"

    c. *invasion* of the other's space and time territory, performed by loud voice, ample gestures, turn interruption and overlapping

    d. *norm violation*, like to go on speaking when the moderator gives the turn to another participant: violation of generally accepted rules implicitly conveys the idea that one is so strong as to be above rules.

Another blatant dominance strategy, mainly used from a down-to-up position, is *defiance*, conveyed by expressions of pride like fixed stare and erected posture, that communicates: "you are not stronger than I, I will finally gain power over you".

Among "subtle" dominance strategies, one is *touchiness*, i.e., to show offended even for slightly negative evaluative words. Being touchy means to have a low threshold for feeling offended, and you feel offended when you think that some communicative or non-communicative action caused a blow to your image. Since there is a somehow a direct correlation between severity of an offence and power of the offended one, to show you are powerful and worth respect you simply need to show offended for things that would not be so serious for other people.

Another subtle strategy is *victimhood*. Playing the victim implies that others unduly did wrong to you, so you are entitled to retaliate and claim to your rights.

In *haughtiness* instead the Sender wants to convey his superiority, but not through boasting, rather through a prig and didactic attitude, as if others were all children or stupid; by *explaining things clearly*, using gestures like the *"ring"*(a circular shape made by thumb and index fingertips touching each other) that evoke precision and seriousness; sitting down with *trunk backward*, as if withdrawing from the other to avoid contact; *half-closed eyelids*, that by conveying relaxation mean "I need not worry about you"; in sum, conveying the other is so inferior you do not bother about him at all.

Also *ridiculization* and *irony* are dominance strategies. Laughter is an emotional expression triggered by surprise and then relief, caused by an incongruous event that leaves you in a suspension but then results not dangerous, so the previous worry results in relief and in a sense of superiority over the event or its cause. Thus, one who *laughs at another* feels (and shows) superior to him, while the other feels impotent – he does not even have the power to scare or worry anyone! – and abased. Also irony, to the extent to which it is a way of teasing, of making fun of another, is a dominance strategy in which aggressiveness is masked by the elegance of a rhetorical figure.

Finally, *easiness* (expressed by a *loose and relaxed posture*) conveys "I am satisfied, I do not depend on you, you have no power over me"; *carelessness* typically entails *not gazing at the opponent*, as if he did not exist – the worst of insults! In *assertiveness* and *calm strength*, *low voice*, *relaxed and fluid gestures* convey self-confidence and no fear of the other, hence superiority.

6 .4 Social emotions

Emotions are an adaptive device that monitors the state of our most important goals: they are multifaceted subjective states, encompassing internal feelings and cognitive, physiological, expressive, motivational aspects, that are triggered any time an important adaptive goal is, or is likely to be, achieved or thwarted.

Within human emotions we may distinguish "individual" ones and three types of "social" emotions (Poggi 2007a). First, those that are felt *toward* someone else; in this sense, while happiness and sadness are individual emotions, admiration, envy, contempt, compassion are social ones: I cannot admire without admiring someone, I cannot envy or contemn but someone, while I can be happy or sad myself. Second, some emotions are "social" in that they are very easily *transmitted* from one person to another: like enthusiasm, panic, or anxiety. A third set are the so-called "*self-conscious* emotions" (Lewis 2000), like shame, pride, embarrassment, that we feel when our own image or self-image, an important part of our social identity, is at stake, and thus concern and heavily determine our relations with others.

We define as *image* (Castelfranchi and Poggi 1990) the set of evaluative and non-evaluative beliefs others conceive of about us, and as *self-image* the evaluative and non-evaluative beliefs that we have about ourselves. Functional to our interaction with other people, we form a "goal of image", the set of standards against which we want to be evaluated positively by others, and a "goal of self-image", those against which we want to evaluate ourselves positively. These are very important goals for our individual and social life: we have a high self-esteem when we evaluate ourselves as positively as we wish to, and a good level of esteem by others when others evaluate us positively. Being esteemed by others is important to have good relationships with them, to be accepted in the community and obtain their help and cooperation. On the other hand, a high self-esteem is functional to be so self-confident as to confront challenging goals, and to be autonomous, not too dependent on others' help.

Given their importance, any time the goals of image or self-image are at stake, the "selfconscious" emotions are triggered. Two such emotions are shame and pride. We feel shame when our goals of image and/or self-image are (or are likely to be) thwarted, and pride when they are achieved.

6.4.1 Shame and the multimodal discourse of blush

Shame is a negative emotion we feel when our goal of image or of self-image – our desire of eliciting positive evaluation from others or ourselves – is certainly or probably thwarted. According to Castelfranchi and Poggi (1990), we are ashamed when we feel we have fallen short of a norm or value that we share with our group, or anyway one with respect to which we want to live up. So we can feel shame both before others and before ouselves. Suppose I pretend to be a good pianist, and while playing in front of my friends I make a mistake; I may be ashamed before them if I think they realized my fault, but I may also feel shame only before myself because, even if they are not so skilled as to realize my subtle fault, I did; and I want to be perfect for and before myself. When a standard makes part of our self-image, we are sincerely sorry any time we fall short of it; but if we share it with our group, our fault might lead the group to reject me and close social relations with me, so we feel shame also before others. In this case feeling, and showing, our shame, is a way to apologize, to tell others: "Yes, I transgressed this norm or value, but I did not do so on purpose, I still share this norm with you; so refrain from aggressing and rejecting me, accept me again in the group". Based on these assumptions, Castelfranchi and Poggi (1990), different from Darwin (1872), who viewed blushing as a mere side-issue of self-oriented attention, argue that the feeling of shame is a sort of internal self-punishment, while its external expression is a communicative signal, namely an apology, a request for forgiveness by one's group. In fact, the communicative display of shame includes three communicative signals:

1. a person S *blushes*, i.e., his/her face reddens
2. S *lowers one's eyes*

3. S *lowers one's head*

N.2. and 3. are actions, resulting in the typical posture of shame, but n.1 is a morphological transitory feature. So while the latter two are to some extent under voluntary control, the former is an involuntary, even, counter-voluntary signal (as already pointed out by Darwin 1872): so much so, that if you blush and you realize it, you would like not to blush (if only because blushing unmasks you have something to be ashamed of), and this makes you blush even more! But also the actions of avoiding gaze and lowering head function to acknowledge one's faults or shortcomings and to apologize for them, to block the group's aggression and prevent rejection.

According to Castelfranchi and Poggi (1990),the three signals make up a multimodal discourse, where each conveys its specific meaning and all converge toward a global meaning. The *blush* (1), making face reddened as one of a baby, might be see as communicating "I am like a baby", which carries the inference "I am inadequate", "I was/did the wrong way, like a baby", thus publicly acknowledging one's inadequacy and inferiority. Signal 2, *lowering eyes*, conveys "I give up to looking at you", and since looking is a way to get power over things or people, it means "I give up my power of control over you", that again means "I am inferior". Signal 3, *lowering head*, shows one is smaller, again acknowledging one's inferiority, and giving up to any defiant attitude. But acknowledging one's inferiority and giving up to defiance, conveyed by lowering face and eyes, and acknowledging one's inadequacy, conveyed by the blush, communicate that one shares the missed value, that one cares the other's judgement. All of this communicates "I am one of you", therefore "Do not attack me".

6.4.2 Pride

You feel pride when, due to an action (e.g. you run faster than others), a *property* (you are stubborn, you have long dark hair), or simply an *event* (your party has won the elections), your goal of image and/or of self-image is fulfilled, that is, when you evaluate yourself, or believe to be evaluated by others, very positively with respect to some goals that make part of your goal of image or self-image. The action, property or event must be due to yourself, or anyway be an important *part of your identity*. You can be proud of your son because you see what he is or does as something stemming from you, or be proud of the good climate of your country just because you feel it as *your* country.

Sometimes one feels *"proud of"* something not only before oneself but also because the positive event, property or action enhances one's own image before others. Before your colleagues in a foreign college, you can be proud of your country winning the football championship since this gives you the image of one belonging to a champion country.

But if the goal of image is sometimes a condition to feel proud of something, is it always a necessary condition? In this, pride and shame are symmetrical. You are sincerely ashamed before others only if your also feel shame before yourself (Cas-

telfranchi and Poggi 1990), that is, only if the value you are evaluated against makes part not only of your goal of image before others but also of the image you want to have of yourself. If you do not share some value (say, to be a very macho man) and others evaluate you against it, but for you own self-mage this is not a relevant value, one you want to live up to, you do not feel shame if you don't look very macho to others. And if you happen to look so, you will not feel proud of it.

Beside being an emotion – a short transitory state – , pride can also be viewed as a more enduring state; a personality trait. A "proud" person is one who attributes a high value to his goal of self-image, mainly to his self-image as an autonomous person, one not dependent on anyone else. In fact, there are two sides of autonomy: self-sufficiency and self-regulation. You are self-sufficient when you possess all the (material and mental) resources you need to achieve your goals by yourself, that is, when you do not depend on others' help. And you are self-regulated when you can decide which goals to pursue, when and how, by yourself: in a word, when you are free. These two sides of autonomy are strictly connected: if you are self-sufficient (you have all the resources you need), you can afford self-regulation (you have the right to be free).

Three types of pride can be distinguished: superiority, arrogance, and dignity pride. In *superiority pride* the proud person pretends he is superior to the other, for instance because he has won over him; in *dignity pride* he only claims to being at the same level as the other, not inferior to him: he wants to be acknowledged his dignity as a human, and credited his right to freedom, autonomy and self-regulation. In arrogance pride, finally, the *proud* person is, at the start, on the "down" side of the power comparison: he has less power than the other, but wants to challenge, to defy his power, and communicates he does have more power than he.

The emotion of pride is expressed by a multimodal pattern of body signals: a small smile, expanded posture, head tilted backward, and arms extended out from the body, possibly with hands on hips (Tracy and Robins 2004). *Smile*, which is in general a signal of happiness, in this case conveys a positive feeling due to one's goal of image or self-image being achieved; the *expanded posture*, enlarging the person's body, conveys dominance, superiority, but also makes one more visible; in fact, one who is proud of something may want to exhibit his merits. *Expanding chest* might be seen as making reference to oneself, to one's own *identity*. *Head tilted back* is a way to look taller, to symbolically communicate one is superior, but it also induces to *look down to the other*, thus, symmetrically, communicating the other's inferiority.

But if these are the expressive signals of pride in general, do different combinations of signals distinguish the three types of pride? Two studies have been carried on to test this hypothesis (Poggi and D'Errico, *forth* b).

 In an observational study a qualitative analysis was conducted on pride expressions in political debates. Results indicate that dignity pride is characterized by *head tilted upward*, but also by signals of worry and anger like a *frown* or vertical wrinkles on the forehead (AU4), *rapid and nervous gestures*, *high intensity of*

voice, eyes fixed to interlocutor and *no smile*; all signalling seriousness of the proud person's request to have one's dignity acknowledged.

Superiority pride is characterized by *low rhythm and intensity of voice* that signal the absence of worry (if you are superior you have nothing to fear or worry about from the other), and sometimes by *gazing away from the Interlocutor* (he is so inferior that he does not even deserve your gaze or your attention). Arrogance pride is characterized by a *large smile*, quite close to a scornful laughter; *expanded chest*, *head tilted back*, and *gaze fixed to the interlocutor*, that convey challenge and defiance, and *provocative*, possibly *insulting words*. The whole pattern conveys that the proud person does not fear the interlocutor even if he is presently superior to him.

Based on this and previous studies an experimental study on the expression of the three types of pride tested the following hypotheses (D'Errico and Poggi *forth*): it was expected that a frown and absence of smile characterize *Dignity pride*, asymmetrical eyebrows and no smile, *Superiority pride*, and absence of frown and presence of smile, *Arrogance pride.* A bifactorial 3 x 2 *between subjects* study was designed with two independent variables (eyebrow position – frown, no frown, asymmetrical eyebrows, and smile – present or absent), and three dependent variables (detection of dignity, superiority or arrogance pride). A multiple choice questionnaire was submitted to 58 subjects (females, range 18-32 years old, mean age 22) where each of 6 facial expressions, constructed by crossing the eyebrow and smile variables, were attributed meanings pointing to dignity, superiority, or arrogance pride. Results show that asymmetrical eyebrows without smile were interpreted as either superiority pride or dignity pride, while frown with smile was mainly attributed a meaning of dignity besides other positive meanings as *I am resolute*, *I want to humiliate you* and *I won.*

In general the frown is primarily interpreted as dignity pride, while the asymmetrical eyebrows orient subjects to an interpretation of superiority, and no frown to arrogance. The smile, probably interpreted as ironic, mainly points to the choice *I will win over you*, confirming its characterizing arrogance. The absence of smile instead is associated to dignity (*I don't submit to you*) and to superiority pride.

6.4.3 Enthusiasm

Enthusiasm is a "social emotion", not in that it is "felt towards" someone else, but in that it typically tends to be "socialized", that is, transmitted to others through contagion. It belongs to the family of happiness, being an intensely positive emotion, felt for the achievement of a very important goal, but it differs from happiness, exultance or elation, both for the goal at stake and for the time it is felt (Poggi 2007). On the one hand, enthusiasm is only felt about goals that are in some way great, important, worth to pursue: for example, in activities that entail novelty and creativity (like creating a new musical group, or founding a newspaper), or for goals of equity and altruism (like fighting for your ideas or defending

noble causes). On the other hand, enthusiasm tends to be felt not so much after the achievement, but during the very pursuit of a goal. The football players feel exultance when the game is over and they have won, but enthusiasm at the moment of a goal. This first achievement triggers a set of proprioceptive sensations typical of high activation: heart beat acceleration, a sense of energy, well-being, good mood, heat, excitation; as you feel enthusiasm you cannot stand still, you want to talk, to hop up and down, to make uncontrolled movements, speak loud, sometimes shout (Poggi 2007).

That such internal energy is felt not when the final objective, but an intermediate goal of the plan is achieved, is functional to sustain the goal pusuit: this though partial success makes you believe that "you can", you have the internal capacities to achieve your goal; achieving the intermediate step makes you feel confident that you will attain the final objective. This enhances your sense of self-efficacy; whereas in trust and hope you rely, respectively, upon other people or world conditions, with enthusiasm you have a feeling of onnipotence: coherent with its etymology "en theòn", which means: "(to have) a God inside"!

This self-attribution of power has two effects. First, you believe that achieving the final goal does not depend on world conditions but on your own action: you feel more responsible. Second, since for decision making rules choosing which goals to pursue in part depends on how likely you can achieve them, if you believe you can, you will strive with particular persistency. Thus the high arousal of enthusiasm can trigger the physiological resources necessary for goal pursuit.

The function of this emotion is then to work as the "gasoline of motivation". The great physiological activation sustained by it fosters physical and mental resources and gives higher persistency, induces self-confidence and renews motivation, providing new energy for action.

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