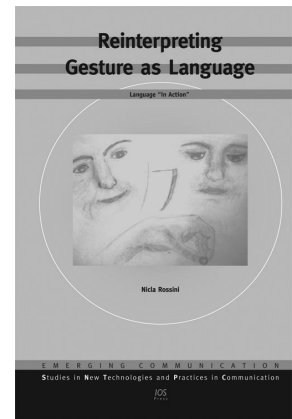


Language in Action

a review of *Reinterpreting Gesture as Language*. *Language "in Action"*

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With the increasing awareness of neural links between gesture and language, the traditional distinction between “linguistic” and “gestural” behaviour has become less clear. Gestures share many traits with certain components of speech (especially prosody) and some of their aspects are studied on a relatively similar methodological basis (Gibbon 2011). Yet, the integration of gesture studies and linguistics remains a challenging task. It is not only the question of unified terminology. Nicla Rossini, the author of the book under review, has a strong academic background in linguistics but most of her research has been devoted to non-verbal communication. Her work clearly draws on the pioneers of gesture studies (McNeill, Kendon) and traditional linguistics, but, simultaneously, it is strongly driven by the cognitivist way of thinking and recent advances in neuroscience. The cognitive-neuroscientific perspective seems to offer a platform where speech and gesture can be studied jointly in the context of interpersonal communication.

Humanities have always been plagued by unclear definitions and hazy notions. Therefore, it is not surprising that the first three sections of the book under review are devoted not only to defining its focus, but also to introducing and explaining fundamental terminology. In a well-thought out introduction, Nicla Rossini reaches back to the seventeenth century to look for the first traces of “modern” gesture studies. This brief but informative overview clearly shows that the idea of the close co-existence of language and gesture was quite obvious to some scholars of the past and that the breakthrough induced by the works of McNeill and Kendon did not come from nowhere. However, among their predecessors, the number of linguists who dared to capture the role of gesture in communication in a more systematic way is almost negligible. Nicla Rossini does not forget to mention Bloomfield and Bolinger. Although in her own approach she leans towards cognitivism, she returns to some linguistic classics many times throughout her book. Presumably, she intends to show the evolution but also a kind of continuity of thought in the study of language, and its changing relationship to the study of gesture.

Another attempt at defining is focused on the notion of Non-verbal Communication (NVC). In order to capture its multifaceted nature, Nicla Rossini visits a number of fields of study. She pays particular attention to the early works by Efron (1941) as well as Birdwhistle and, later, Kendon, both of whom he inspired. She points to the fact that for his kinetics, Efron adopted the structural approach typical of phonology (where kineme is understood as a non-verbal equivalent of phoneme). She tracks the similarities and differences between Birdwhistle's kinesics and Kendon's later works. Moreover, she briefly addresses a number of influential ideas stemming from proxemics, ethology, semiotics as well as philosophy and pragmatics. Some formal and computational works are also included. Language-Action Theory (Flores & Ludlow 1980) appears to be especially relevant in the context of the present book. A significant contribution of ethology (followed by many scholars dedicated to the study of non-verbal behaviour) as well as MacKay's (1972 and later) and a more recent Poyatos' work (2002) is mentioned.

NVC is initially understood as referring only to these non-verbal cues “that are intended as communicative and/or interactive in the sense of Ekman and Friesen work (1969).” However, after a relatively thorough discussion of possible viewpoints, Nicla Rossini returns with a more precise definition of NVC as

the intentional transmission of information, either for representational, emotive, poetic, and conative purposes, from a transmitter A to a receiver B, mainly and prototypically through the visual channel, but also through the vocal-auditory channel, by means of specific codes, either innate or culturally-determined, that are not usually specialized for verbal communication.

While constituting a step forward, the definition refers to the classical categories of language functions and to an early model of communication. The notion of intentionality is adopted from MacKay's (1972) study which is likewise a relatively dated work. As the term “non-verbal” has been criticised as inappropriate for gestures by McNeill (1985) and others, it may be surprising that the Author did not look for a different one.

The questions of communicativeness and intentionality in (gestural) communication remain fundamental and... unanswered. Intentions are hardly accessible for empirical studies and remain hypothetical mental processes, despite a long record of efforts devoted to their identification and understanding. Nicla Rossini proposes more flexibility when it comes to deciding on the communicative value and intentionality – not only of gestures but also of speech. Some aspects of speech are difficult to control intentionally, sometimes speech may be focused on inner communication or just on the internal planning of actions. These facts do not deny its communicative intentionality and should not be an argument for denying it in the case of gestures.

Nicla Rossini makes her own attempt to define gesture itself. As in the previous chapters, the problem is approached from multiple directions, starting with the etymology of the word. Much attention is paid to the available categorisations of gestures and to their specific classes. While the early distinction between communicative and non-communicative gestures (Rosenfeld 1966) may be still acceptable, one would expect more recent viewpoints to be included. The Author moves from Ekman's and Friesen's categorisation (as based on Efron's ideas) through Argyle's proposal and, finally, towards McNeill's and Levy's conception (1982). She discusses and compares these approaches in detail but mentions many others. She also refers to Kendon's distinction between *gesticulation* (occurring as bound up with speech) and *autonomous gestures* – standardised and apt to function independently of speech. A problematic issue that touches some of the available categorisations is that their categories are defined on *different levels* – i.e., using different criteria and referring to various classes of processes.

In this context, the question of *multifunctionality* arises. Apparently, there is no reason to reject the possibility that a single gesture may realise many functions or belong to multiple functional categories. It might be fruitful to follow recent developments on the ground of dialogue analysis (Bunt 2009).

In the final part of the chapter, Nicla Rossini brings up the notion of lexical access drawing on the Levelt's (1987) model of speech production. She points out that “if one interprets gestures as semiotic means, it is easy to see that a form or combination of forms and trajectories is usually aimed at conveying a precise content, or “signified” (in the Saussurean sense).” This thought leads the Author to her own understanding of gestures. She defines them as “intentional movements of hands, arms, shoulders and head, occurring within communicative acts, whose lexical access is shared both by the speaker and the receiver,” while co-verbal gestures as “a subset of gestures strictly correlated to and co-occurring with speech within communicative acts”. Nicla Rossini re-defines also gesture categories (emblems, metaphors, iconics, beats and deicits). While superficially similar to those by McNeil and Levy as well as to Kendon's approach, Rossini's definitions introduce more flexibility.

The fourth chapter of the book, devoted to the cognitive foundations of gesture, starts with the widely discussed issue of interrelations between speech and gesture. Are gestures non-verbal? But what does “being verbal” mean? If Rossini's understanding of gesture implies lexical access, it must be “verbal” in a sense. If gesture and speech are >>the overt product of the same internal processes<< (as suggested by McNeill 1985),

why should they be different in this particular respect? Still, the issue may become less obvious when various categories of gestures are taken into account, as it is shown in Butterworth and Hadar's model (1989).

Gestures are sometimes compared to the prosodic component of speech. In fact, there are many similarities, including those which make both of them difficult to deal with. One of most popular approaches is to divide prosody into linguistic and non-linguistic (e.g. emotional). Gussenhoven (2004) argues that the linguistic component of intonation is characterised by discretely different pitch contours which refer to (discretely) different linguistic categories as well as arbitrary form-function relations and a duality of structure. If one finds this distinction appealing, it might be possible to re-apply it on the grounds of gesture studies.

Tracking the cognitive foundations of gestures, Nicla Rossini very aptly chooses the areas to look for evidence: the emergence of gesture in infants and the gestural behavioural of aphasics and the blind. Due to technical difficulties, ethical issues as well as conceptual problems, infant and child gestures still remain understudied even though such inquiry might provide answers to some fundamental questions of the field. Such studies rarely go beyond observations. There is, however, much evidence on the importance of gesture in early child-parent interaction and on pointings as the first category of gestures to emerge in infants. Nicla Rossini refers to Hewes', Werner's and Kaplan's as well as de Laguna's works showing that early iconic gestures in children are gradually replaced with vocalisations and verbal expressions and therefore can be regarded as "a primitive mode of cognitive representation".

When discussing gestures in aphasics, Nicla Rossini mostly bases her work on Feyereisen's (1991a, b) studies. She mentions his critique of the verbal vs. non-verbal dichotomy in the context of hemisphere functions. However, since the nineties, a huge body of work has been published on the localisation of language functions in the brain as well as on their disorders. Even though the general tendency towards a complex, distributed model of processing is still dominant, more findings could have been mentioned here. In her brief discussion on gestures in the blind, Nicla Rossini reveals some of their peculiar features. For example, when using pointings (which happens extremely rarely), the blind sometimes add an acoustic cue by tapping the referent. In the conclusion, however, the Author admits that there is no substantial evidence that some categories of gestures ("flat hand") performed by blind were intended to communicate rather than to support orientating mechanism for the self.

In Chapter 5, the issue of intentional and communicative value of gestures is addressed. Nicla Rossini gives a reasonably detailed review of the two main opposite views and their major claims and does not forget about some other approaches. She mentions also de Ruiter's (2000) conciliatory suggestion that the conflict between the two views is merely apparent. Herself, she seems to be prone to advocate for the more straightforward Kendon's approach stating that gestures provide information about the semantic content of the utterances. She criticises the analysis of Krauss et al. (2000), pointing to a possible misinterpretation of the key gesture in the material under study. Rossini follows the thought of Cassel who stresses that gestures seem to be listener-oriented as they are normally produced synchronously with the rheme of the

accompanying utterance. She also argues that the claim that gestures are not communicative because they do not convey unequivocal meanings themselves is not justified: by definition, they always co-occur with speech. One must note, however, that the understanding of what “to communicate” means may significantly influence such discussions.

The crucial part of the presently discussed chapter is devoted to the reinterpretation of gesture as a prototype category. In order to arrange gesture categories, Nicla Rossini employs five parameters: intentionality, awareness, abstraction, arbitrariness, and extension. As a consequence, she obtains a representation of gesture as a (Roschian) category with the arbitrary emblems in the middle as “the most intentional, aware, arbitrary and abstract class of gestures” and with the most outer circle belonging to batons (beats) which “do not have lexical access but follow and resemble the rhythm of co-occurring speech flow”. She proposes a gradient approach to intentionality which seems to be very natural and probably may also be applied to verbal behaviour. Various categories of gestures can be attributed with various degrees of intentionality over the semiotic continuum.

In search for support for her hypothesis, Nicla Rossini carries out an empirical study based on a series of three conversational sessions with a group of five Italian native speakers. The sessions differ in the degree of formality, from a job interview in a foreign language (English) to a guessing game in the native language of the subjects. The use of the foreign language was intended as an additional obstacle to evoke more gesturing. The Author assumes that less intentional gestures would be more difficult to inhibit in formal situations while those highly intentional (like emblems) would be easier to control. Her observations support these claims and indicate that co-verbal gesticulation helps speakers in thinking, also by dissipating emotional excitement. However, the technical description of the experiment is rather sparse and the number of subjects is quite limited when confronted with the set of variables coming into play. As a result, it helps to gather some hints and cues but cannot provide conclusive results.

Going further in her efforts towards bringing gestures back to language, Nicla Rossini makes an attempt to prove that gesture, together with speech, is an instantiation of the human language capacity. She addresses the issue from a neurological perspective and starts with an overview of the studies and views on the neural correlates of language. She confronts the idea of modularity of mind (Fodor 1983) and the connectionist approach involving distributed processing. In this context, she also discusses a selection of hypotheses on the origin of language. While it was obviously not intended to give justice to all of them, at least a few more sentences on the McNeill's claim that language originated as a multi-modal system would have been welcome.

Nicla Rossini cites a number of works devoted to the issue of lateralisation and argues that some traditional approaches to the function of brain areas as “language control centres” cannot hold any longer as many other factors and areas contribute. Although this view is not new, it turns out to be difficult to find sufficient and direct experimental support for it. As the Author argues, the results of neuroimaging studies are still extremely difficult to interpret and they may support significantly different views on

the nature of the neural substrates of language. Nevertheless, many neuroimaging studies mentioned in the chapter show that there exists a strong link between the syntax of natural language and the syntax of human action (Bongioanni et al. 2002). Another relatively new and seminal idea is modelling the functions of human nervous system in terms of the Darwinian principle of selection applied to neuronal groups, which has been already supported by recent fMRI studies (Edelman 1987). The declaration by Armstrong et al. (1995) on the necessity of redefining the physiological base for language does not sound very radical today. The idea of distributed processing has gained popularity but it is still difficult to judge specific contributions from the neuronal units involved and their interactions as they are extremely difficult to isolate.

In search for support for one of the main hypotheses of her book, Nicla Rossini conducts another experiment focused on gesture-speech synchrony. The participants are asked to perform simultaneously two activities: to read a piece of prose or a poem, and to imitate a beat (rhythm) previously presented by the experimenter. Although depicted in more detail than the first one, this one also needs more light to be shed on its technical aspects, including transcription and annotation. A more quantitative-oriented approach would probably be beneficiary as well. One may argue whether knocking on the table can actually be classified as gesturing. Obviously it bears much resemblance to beat gestures but, as a study by Karpiński et al. (2009) shows, the synchrony rules hypothesised by Kendon (1980) and McNeill (1985) may be violated due to the influence of external, contextual factors. Moreover, although the methods for analysing synchrony between rhythmically complex phenomena like speech and gesture are still under development, some promising approaches have already emerged (e.g., Port & Cummins (1996), Cummins (2009), Leonard & Cummins (2010); see also Rusiewicz (2011) for a brief overview).

The history of gesture-speech synchrony hypotheses formulated by Kendon and McNeill as well as the arguments of Butterworth and Hadar (1989) form a departure point for the seventh chapter. Nicla Rossini assumes that the presence of synchronisation patterns in congenitally deaf orally educated subjects would prove that they are inborn. In order to obtain empirical support for her claim, she analyses a stretch of spontaneous conversation (involving congenitally deaf speakers) for co-occurrences of gestural strokes and accented syllables. She reports that Kendonian rule was always followed (strokes should occur no later than the corresponding accented syllables). Blind subjects synchronise gestures and speech, providing another piece of evidence for the shared cognitive-computational origin of speech and gesture. Again, although based on careful observations, the results might have been more convincing if the author had provided more detailed information on the technical aspect of the study. The detection and precise tagging of prominences in speech and kinematic landmarks in the stream of gestures, as well as deciding on their hierarchy and mutual relations, is not a trivial issue, especially when dealing with sparse data, coming from only few subjects. These flaws are somewhat compensated by a gist of precious finding regarding gestures in the deaf, especially on their locus, the point of articulation and the gesturing rate.

The link between prosody and gesture may be of a complex nature. Asynchronous gesturing is simply more difficult (e.g., musicians must practise to use their hands independently) and it may require divided attention. Speech can be viewed a sequence of gestures, sharing the nature of any other volitional body movements (Gibbon 2011). Besides, there may exist “semantic” or “linguistically driven” synchrony. It can be defined as the mechanism responsible for producing certain units of speech and gesture in adequate timing so that they can form meanings together. From the viewpoint of perception, the phenomenon is equally complex, but a brief look at the studies on rhythm perception may prove useful here (e.g. B. H. Repp's works). Basic synchrony between speech and gesture can be understood in terms of synchronised kinetic activity although it remains difficult to capture and measure. The notion of entrainment, coupled oscillator model and dynamic system modelling belong to promising approaches.

Nicla Rossini concludes that gestures may be embedded in our everyday interactions because of their “unavoidable nature” due to the ontogenetic properties of the human brain: the frequently mentioned proximity of the Broca area and the motor area of the cerebral cortex cannot be accidental. She finally admits that the hypotheses of Butterworth and Hadar (viewing gesture as a mere epiphenomenon of speech) may be true – but only from the phylogenetic perspective. She suggests that the communicative function of gesture may have evolved just because the presence of gestures was inevitable anyway, and views beats as relics of communicative movements.

In the eighth chapter of the book, Nicla Rossini discloses her views on how the methods of parsing should be adjusted in order to accommodate the gestural component of utterances. She introduces the notion of Audio-visual Communication (AVC) in order to stress the fact that the object of linguistic inquiry should be redefined and go beyond the traditionally accepted boundaries of language. Her scheme of AVC system is convincing, but it is limited to speech and gesture. Moreover, even if one decided to remain within the limits of aural and visual phenomena, a more detailed and precise representation might have been welcome in order to reflect the thoughts that are in the text anyway.

Nicla Rossini makes an excursion towards very traditional morphology and lexical semantics. Perhaps more flexible but, simultaneously, more formalised frameworks would also be inspiring here (e.g. Optimality Theory (Prince, Smolensky 1993)). The paradigm of Natural Linguistics (e.g. Dressler 1990) would probably also be able to accommodate the gestural component of language. The concept of “gesture grammar”, while certainly tempting (cf. C. Mueller's team recent project), may raise some problems. As we know, approaches that work on the sentence level may not be appropriate for other levels (cf. the critique of “discourse grammar” or “text grammar”).

In her approach to simultaneous perception of speech and gesture, Nicla Rossini follows Massaro's model which reflects the fact that articulatory movements produce both vocal and gestural output. As she admits, however, any structural model enforces certain simplifications. Furthermore, in the studies of multimodal perception, possible cross-modal effects should be taken into account.

Nicla Rossini discusses the issues of gesture morphology extensively and in detail. This is probably another way of showing that the “language of gestures” is not so far removed from the spoken one. Starting with a solid theoretical preparation, she formulates her postulates for the morphology of gesture that are based on the reinterpretation of the parameters which are widely applied in the description of sign languages (size, timing, oscillation, point of articulation and locus).

A separate subchapter is spared for the vividly discussed phenomenon of recursion in language (Hauser et al. 2002, Pinker and Jackendoff 2005, Fitch et al. 2005 as well as the most recent collection of papers that can be found in van den Hulst, ed. 2010). Nicla Rossini points to the fact that some problems in the debate on recursion may be due to its restricted understanding. She also notices that the limitations of human brain do not allow for “true” recursion but rather for recurrence, and refers to Byrne (2003) to show that the behaviour of animals can also be viewed as recursive. She demonstrates that recursion is a property of the gesture system, but also points out that while examples of recursion in the weak sense are common, “stronger” recursion can be found where “not only do gestures completely replace the speech signal, but they are also performed within the syntax”. While explaining the origin and application of the concept of recursion in linguistics, she refers to Levelt's model of speech production (1989), to Krauss' model (Krauss and Hadar 1999) of speech and gesture production, as well as to a more recent and complex model by de Ruijters (2000). She finds, however, that even de Ruijter's model treats the production of gesture and speech as separate (although simultaneous) processes.

In this context, Nicla Rossini elaborates further on her idea of computational AVC parsing and proposes her own model which integrates speech and gesture production. While some of its aspects (including its psychological reality) may be disputable, it is an important contribution and one of the key points of the book. The model accounts for recursion and at least partially for the common processing of speech and gesture, from the stage of conceptualisation to the stage of motor commands. Nicla Rossini shows how multimodal utterances can be parsed in the proposed framework. Examples are illustrated with sequences of movie frames and detailed transcriptions. The model adopted for the description of AVC is demonstrated to be capable of representing complex communicational behaviour and the structural complexities of multimodal utterances.

Closing this stage of discussion, Nicla Rossini redirects readers' attention towards planning and self-orientation processes which are central to the subsequent chapter of her book. There, she steps beyond the communicative perspective and moves back towards inner, mental processes again. The works by Piaget, Luria and Vygotsky are declared here as constituting the frame of reference for the discussion and her own studies. Bloomfield is also briefly mentioned as “the only well known linguist” who devoted some attention to the self-directional aspect of language. Although these historical contributions still remain influential, it might be surprising to find that more recent cognitively-oriented works are omitted. Despite these disputable choices, the background for Rossini's empirical studies is precisely and consistently prepared.

The study itself is based on the widely used map task dialogue procedure, with one person giving and the other following route directions. Here, the maps of the instruction givers and followers differ in some detail and each pair of the participants is separated by a screen which blocks mutual visibility. Much place is devoted to detailed discussion of rich audiovisual material and of the sections contains a full transcript of the session, presented along with sequences of movie frames. As previously, Nicla Rossini proves to be an insightful and meticulous observer. Again, some readers would probably expect more information on the transcription and annotation techniques as well as on the video capture set-up. Nevertheless, the findings are valuable and include the discovery of a new gesture, namely “a palm-down-flap”. Nicla Rossini suggests that the gestures that occur in this (non-facing) condition are not invoked from “imaginistic short term memory” but rather from “self-orientation in space and planning”. In the interpretation of her findings, she refers again to de Ruiters' (2000) hypothesis that the usage of gestures may be due to the adaptation of behavioural patterns typical of the “default” condition of mutual visibility. Blocked visibility does not block gesturing (Rimé 1982) and some studies report that the number of gestures in the condition of limited mutual visibility may be actually even higher but the gestures are realised in lower areas of the gesture space (Jarmołowicz-Nowikow & Karpiński 2011). Certainly, it may depend on the communicative situation and on the profiles of the participants themselves.

Summarising her findings, Nicla Rossini points to the fact that the amount of posture shifts and gaze shifts towards the interlocutor was significantly reduced. Still, “gaze tended to focus on the area where the partner is supposed to be while waiting for responses or feedback.” She also mentions posture shifts and gestures related to planning. In general, she shares and supports Alibali's view (Alibali et al. 2001) that gestures, independently of their communicative and interactive functions, serve self-regulating and planning functions, being a means of self-orientation and self-organization.

The closing chapter of the book is devoted to available and potential technological applications of non-verbal communication research in human-machine interaction. Besides pointing to some implementations, it also offers the reader a technological perspective on some problems discussed earlier in the book. Many important questions regarding the design of Embodied Conversational Agents [ECAs] and robots are put forward here: how can we make them believable and trustable, and how to equip them with a sort of “communicative intuition”? Nicla Rossini stresses that even apparently small details of behaviour, like synchrony of speech and non-verbal cues, may significantly help in reaching these aims. Gaze directing and other categories of visible behaviour may also contribute. The amount of gestures as well as the proportion of speech to gesturing can also be of importance. One should also consider the influence of the social context on the occurrence and quality of non-verbal behaviour.

Nicla Rossini refers to two basic approaches to the architecture of software agents and robots which are typically *function-based* (Nilsson 1984) or *behaviour-based* (Brooks 1991). She also mentions the efforts towards enriching the behaviour of machines with the emotional component. While the ideas and suggestions of the Author are accurate

and well-thought out, the reader may feel that this section is not as well-grounded in literature as other chapters. A reference to the pioneering works of Rosalind Picard in emotional computing (e.g., Pickard 2000) would have been welcome. Even a relatively old text by J. Bates (1994) on the role of emotionality in believable agents could have been cited here as it gathers some ideas that are still valid and important. For more examples of applications, one could also consult a recent book by Scherer et al. (2010).

Most of Nicla Rossini's comments pertain mostly to two robots (iCube and Nexi) and one virtual agent (GRETA). Some portions of their gestural behaviour are analysed and, as the Author suggests, certainly there is much room for improvement. Later in the chapter, Nicla Rossini proposes her own architecture for "a more natural agent," with some innovative suggestions. Among them, the statement that "a definite improvement should be observed with a different architecture relying less on Fuzzy Logic and a review of the lexicon for the generation of gestures and expressions" strikes as quite surprising and, as such, would probably require further elaboration. The discussion on the interface design and typical programming approaches is somewhat shallow. It is understandable that going deeper into technological details was not the purpose of the chapter but the problem is that in this respect it offers only slightly more than a word of tempting inspiration.

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The meeting of linguists, gesture researchers, psychologists, sociologists, and others, on a common ground of communication studies still remains relatively superficial. How to come closer together while remembering the roots and achievements of the traditional disciplines? The new ideas proposed in the book under review come mostly from re-interpretations of some existing notions, from importing ideas from one field to the other. Nicla Rossini's answer seems to resolve itself in meticulous analysis and profound understanding of the existing knowledge, and its re-interpretation and verification in the new frames and paradigms. The title of the book suggests that the idea of gestures as a part of language has been always around somewhere and the question is only how to bring it back using adequate methodology and recent technological achievements. Taking short-cuts is tempting and sometimes more efficient, but the approach adopted here is not only honest but also gratifying.

Communication Studies are overwhelmed by technological progress. Researchers have extremely powerful tools at hand but sometimes cannot tame them or happen to be not cautious enough in the interpretation of results. Nicla Rossini points out that in certain contexts it may be still safer and more efficient to remain on the level of external behavioural observations in empirical studies than to base one's findings solely on the incredible amounts of data coming from functional neuro-imaging studies.

Even though readers will quickly find that Nicla Rossini is more a gesture researcher than anything else, her paths are clear and easy to follow independently of the discipline she touches upon in the text. Her readers may feel well-guided and enjoy rich

but precisely adjusted theoretical background. In some places, psycholinguists or computational linguists may be slightly disappointed by the limited or shallow referencing, a problem typical of multidisciplinary studies.

Nicla Rossini remains under a strong influence of cognitive linguistics and neuroscience but she still finds inspiration in the classical works of structuralists. It is admirable that in most cases she manages to trace important ideas occurring in her work back to their origins. On the other hand, maybe some place could have been spared for more recent models, approaches and theories.

The most significant contribution of the book resolves in re-defining gesture on the cognitive ground as a prototype category, re-arranging the categorisation of gestures, determining the place of gesture in the process of communication and presenting empirical support for the formulated hypotheses in a series of studies. The discussion on intentionality and the communicative value of gesture not only shows the essence of the former achievements, but also adds some fresh critical thoughts. The investigation in gesture morphology provides means to reach the ultimate goal of the book, but it is also an important independent contribution. The section devoted to the origin of language and the emergence of gesture in infants, including the discussion of the origin of pointing gestures, is also very informative and valuable. The closing chapter bridges research and its potential applications, and may be recommended to those who are reluctant to believe that “humanities” significantly contribute to technological progress.

The empirical studies by Nicla Rossini offer a gist of interesting findings rather than a set of statistically interpretable data. Yet, she certainly knows where to look for support for her hypotheses and realises the limitations of her approach. The data from the congenitally deaf subjects are exceptionally valuable, unique and difficult to extend. In the case of map task dialogues, more material is available and it can be analysed in future, probably even as a part of cross-cultural comparative studies. Empirical studies of communication are extremely tedious, time consuming and technically difficult. Nevertheless, while many case studies are extremely valuable, researchers tend to crave for generalisations and for reproducible experiments.

The book is coherent as a sequence of chapters and the reader is well guided from the point of defining some fundamental notions, to the new theoretical constructs and further, to their experimental verification and potential technological applications. The text is definitely inspiring in terms of possible directions of research and lists of unsolved problems. For those who are new to the multi-modal communication studies, it offers a valuable discussion of most of the fundamental problems. It contains a bunch of new ideas, theoretical formulations and empirical attempts for those who have been a part of the field for some time. Nicla Rossini confirms her multidisciplinary background and shows flexible, wide and interdisciplinary thinking. A rich, multifaceted piece of literature to keep somewhere within the reach of hands when one needs inspiration for new research.

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References

- Alibali, M. W., Heath, D. C. & Myers, H. J. 2001. Effects of visibility between speaker and listener on gesture production: Some gestures are meant to be seen. *Journal of Memory and Language*, 44: 169–188.
- Armstrong, D. F., Stokoe, W. C. & Wilcox, S. 1995. *Gesture and the Nature of Language*. Cambridge: CUP.
- Bates, J. 1994. The Role of Emotion in Believable Agents. *Communications of the ACM. Special Issue on Agents*.
- Bongioanni, P., Buoiano, G., and Magoni, M. 2002. Language impairments in ALS/MND (Amyotrophic Lateral Sclerosis/Motor Neuron Disease). In: *Proceedings European Society for Philosophy and Psychology Meeting 2002*: 20-21, Lyon, France.
- Brooks, R. A. 1991. Intelligence Without Reason. *Proceedings of 12th Int. Joint Conf. on Artificial Intelligence*, Sydney, Australia, August 1991: 569-595.
- Bunt, H. 2009. Multifunctionality and multidimensional dialogue semantics. In *Proceedings of Dia-Holmia, 13th Workshop on the Semantics and Pragmatics of Dialogue*, Stockholm: 3–14.
- Butterworth, B. & Hadar, U. 1989. Gesture, speech, and computational stages: A reply to McNeill. *Psychological Review*, 96, 168-174.
- Byrne, R. W. 2003. Imitation as behaviour parsing. *The Philosophical Transactions of the Royal Society*, 358: pp. 529–536.
- Cummins, F. & Port, R. F. 1996. Rhythmic commonalities between hand gestures and speech. In *Proceedings of the Eighteenth Annual Conference of the Cognitive Science Society*, Lawrence Erlbaum Associates.
- Cummins, F. 2009. Rhythm as an affordance for the entrainment of movement. *Phonetica*, 66 (1-2): 15-28
- Dressler, Wolfgang U. 1990. The cognitive perspective of “naturalist” linguistic models. *Cognitive Linguistics* 1-1: 75-98.
- Edelman, G. M. 1987. *Neural Darwinism: Theory of Neuronal Group Selection*. Basic Books: New York.
- Efron, D. 1941. *Gesture and Environment*. King's Crown Press: New York.
- Ekman, P. & Friesen, W 1969. The repertoire of non-verbal behavior: Categories, origins, usage and coding. In *Semiotica* 1(1): 49-98.
- Feyereisen, P. 1991. Brain Pathology, Lateralization and Nonverbal Behavior. In: Feldman, S. and Rimé, B. *Fundamentals of Nonverbal Behavior*. Cambridge University Press: Cambridge.
- Feyereisen, P. 1991. Communicative behavior in aphasia. *Aphasiology*, 5: 323-333.
- Fitch, W.T., Hauser, M.D., and Chomsky, N. 2005. The evolution of the language faculty: Clarifications and implications. *Cognition*, 97: 179–210.

- Flores, F. & Ludlow, J. 1980. Doing and Speaking in the Office. In: Fick, G. and Sprague, R.H. (Eds.), *Decision Support Systems: Issues and Challenges*, New York: Pergamon Press: 95-118.
- Fodor, J. A. 1983. *The Modularity of Mind*. Cambridge, MA: MIT Press.
- Gibbon, D. 2011. Modelling gesture as speech: A linguistic approach. *Poznań Studies in Contemporary Linguistics* 47(3).
- Gussenhoven, C. 2004. *The Phonology of Tone and Intonation*. Cambridge: CUP.
- Hauser, M.D. Chomsky, N. & Fitch, W. T. 2002. The Faculty of Language: What Is It, Who Has It, and How Did It Evolve? *Science*, 298:1569-1579.
- Hulst, H.G. van der (ed.) 2010. *Recursion and Human Language*. Berlin: Mouton de Gruyter.
- Jarmołowicz-Nowikow & E. & Karpinski, M. 2011. Communicative intentions behind pointing gestures in task-oriented dialogues. *Proceedings of GESPIN 2011 Conference*, Bielefeld.
- Karpiński, M., Jarmołowicz-Nowikow, E. & Malisz, Z. 2009. Aspects of gestural and prosodic structure of multimodal utterances in Polish task-oriented dialogues. In: G. Demenko, K. Jassem, St. Szpakowicz (Eds.) *Speech and Language Technology*, vol. 11, Poznań: Polish Phonetic Association.
- Kendon, A. 1980. Gesticulation and Speech: Two Aspects of the Process of Utterance. In: Key, M.R. (Ed.), *The Relation Between Verbal and Nonverbal Communication*. The Hague: Mouton.
- Krauss, R.M., & Hadar, U. 1999. The role of speech-related arm/hand gestures in word retrieval. In: R. Campbell & L. Messing (Eds.), *Gesture, speech, and sign*. Oxford: OUP.
- Krauss, R. M., Chen, Y. and Gottesman, R. F. 2000. Lexical gestures and lexical access: A process model. In: McNeill, D. (Ed.), *Language and Gesture*. Cambridge: CUP.
- Levelt, J. M. 1989. *Speaking. From Intention to Articulation*. MIT Press: Cambridge, MA.
- Leonard, T. & Cummins, F. 2010. The temporal relation between beat gestures and speech. *Language and Cognitive Processes*,
- MacKay, D. M. 1972. Formal Analysis of Communicative Processes. In: Hinde, R. A. (Ed.), *Non-Verbal Communication*. London, New York, Melbourne: CUP.
- McNeill, D. 1985. So you think gestures are nonverbal? *Psychological Review*, 92: 350-371.
- McNeill, D. & Levi, E. 1982. Conceptual Representations in Language Activity and Gesture. In Jarvella, R. J. and Klein, W. (Eds.), *Speech, place and action*. Chichester: Wiley and Sons.
- Nilsson, N. (Ed.) 1984. *Shakey the Robot*. Technical Note 323, SRI International, Menlo Park, CA.
- Pickard, R. 2000. *Affective Computing*. MIT Press.
- Pinker, S. & Jackendoff, R. 2005. The Faculty of Language: What's Special about it? *Cognition*, 95: 201-236.
- Poyatos 2002. *Nonverbal Communication Across Disciplines: Culture, Sensory, Interaction, Speech, Conversation*. Amsterdam: John Benjamins Publishing
- Prince, A. & Smolensky, P. 1993. *Optimality Theory: Constraint Interaction in Generative Grammar*. Oxford: Blackwell Publishers.
- Rimé, B. 1982. The Elimination of Visible Behavior from Social Interactions: Effects of Verbal, Nonverbal and Interpersonal Variables. *European Journal of Social Psychology*, 73: 113-129.

Rosenfeld, H. M. 1966. Instrumental Affiliative Functions of Facial and Gestural Expressions. *Journal of Personality and Social Psychology*, IV: 65-72.

de Ruiter, J. P. 2000. The Production of Gesture and Speech. In McNeill, D. (Ed.), *Language and Gesture*. Cambridge: CUP.

Rusiewicz, H. L. 2011. Synchronization of prosodic stress and gesture: A dynamic systems perspective. *Proceedings of GESPIN 2011*, Bielefeld.

Scherer, K., Baenziger, T., Roesch, E.B. 2010. *Blueprint for Affective Computing*. Oxford: OUP.