



NetWordS Final Conference

WORD KNOWLEDGE AND WORD USAGE Representations and Processes in the Mental Lexicon

Pisa (Italy), March 30th – April 1st 2015
Scuola Normale Superiore

SCIENTIFIC REPORT

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Science Meeting – Scientific Report

Proposal Title: *WORD KNOWLEDGE AND WORD USAGE – Representations and Processes in the Mental Lexicon*

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1) Summary (up to one page)

The final NetWordS Conference, held on the 30th and 31st of March, and 1st of April 2015 in Pisa, was convened by Prof. Pier Marco Bertinetto, Dr. Vito Pirrelli and Dr. Claudia Marzi, and brought together 91 participants (scholars, Post-Docs, PhD students) from numerous European, and some non-European, countries.

A 3-day schedule involved all participants in a focused, cross-disciplinary discussion on *representations and processes in the mental lexicon*.

People are known to understand, memorise and parse words in a context-sensitive, opportunistic way, by caching their most habitual and productive processing patterns into routinized behavioural schemes, similarly to what we observe for sequences of coordinated motor acts. Speakers, however, do not only take advantage of token-based information such as frequency of individual, holistically stored words, or episodic memories of word usage, but they are also able to organise stored word forms through abstract paradigmatic structures (or word families) whose overall size and distribution are important determinants of lexical categorisation, inference and productivity. Lexical organisation is, in fact, not necessarily functional to descriptive economy and minimisation of storage, but appears to be influenced by more dynamic, communication-oriented functions such as memorisation, prediction-based recognition and production.

Lending support to this view, usage-based approaches to word processing have recently offered novel explanatory frameworks that capitalise on the stable correlation patterns between lexical representations on the one hand and process-based operations that make representations functional to communicative exchanges on the other hand. By focusing on the battery of cognitive functions supporting verbal communication (ranging from input recoding to rehearsal, access, recall and coactivation) and by exploring their

psycholinguistic correlates and neuroanatomical substrates, these approaches promote a new view of language architecture as an emergent property of the interaction between language-specific input conditions and low-level, domain-specific cognitive predispositions.

2) Description of the scientific content of and discussions at the event (up to four pages)

NetWordS' mission was to bring together experts of various research fields (from brain sciences and computing to cognition and linguistics) and of different theoretical inclinations, to advance the current awareness of theoretical, typological, psycholinguistic, computational and neurophysiological evidence on the structure and processing of words, with a view to developing novel research paradigms and bringing up a new generation of language scholars. The conference was intended to provide a forum for assessing current progress of cross-disciplinary research on language architecture and usage, and discussing prospects of future synergy.

In detail, the conference intended to address issues related to word knowledge and word usage from a cross-disciplinary perspective by encouraging contributions focusing on the following two main areas (and their possible interconnections):

- usage-based approaches to bootstrapping word form and structure (morpho-phonological and morpho-syntactic issues) including, but not limited to:
 - o incremental acquisition of lexical categories
 - o emergence of morphological structure
 - o modelling lexical memories
 - o anticipatory prediction-based mechanisms of word recognition
 - o word production
 - o frequency-based models of lexical productivity
 - o word encoding
 - o models of lexical architecture
 - o family-based effects in word processing
 - o word reading and writing
- usage-based approaches to word meanings (lexical semantics and pragmatics in morphologically simple and complex words) including, but not limited to:
 - o distributional semantics
 - o interpretation of compounds
 - o concept composition and coercion
 - o conceptualisation of perception and action
 - o time and space in the lexicon
 - o metonymy and metaphor sense extensions
 - o meaning polarity
 - o lexical, context-based and encyclopaedic knowledge

- ambiguity, polysemy and vagueness
- perceptual grounding and embodied cognition in the lexicon
- semantic association and categorisation

The 3-day schedule was articulated in three main sessions: psycho-computational and theoretical issues in lexical organisation and access (day one); processing and representation of meaning in language production (day two); neuro-functional correlates of language processing (day three). All accepted contributions were presented as either oral or poster presentations.

The opening session included an official welcome by the conference organisers and an address by Milena Zic-Fuchs on the past and future of European interdisciplinary inquiries in the mental lexicon, with a special focus on the current European funding scenario and the prospects of Horizon 2020.

On day one, Wolfgang U. Dressler's invited talk "Psycholinguistic illusions in and on morphology" provided a comprehensive reappraisal of some of the methodological tenets and putative illusions in more or less recent psycholinguistic research on the mental lexicon, including its cross-disciplinary interaction with neighbouring disciplines, such as theoretical and computational morphology. His insightful overview ranged from the ecological validity of single-word lexical decision protocols, to the over-reliance on word frequency effects, as opposed to perceptual and pragmatic lexical salience, in assessing speakers' verbal behaviour, to the paramount importance of input and socio-economic factors in developmental word acquisition.

On the same day, Gabriella Vigliocco's talk ("The bridge of iconicity: from a world of experience to experience of language") explored the central notion of arbitrariness between linguistic form and meaning as one of the most persisting assumptions in language studies, to suggest that the question of how linguistic form links to meaning is central to language development, whether in connection with spoken or sign language, and that cross-talking between the two language modalities can provide novel insights into the physiology of human communication.

The accepted contributions presented on day one dealt extensively with psycholinguistic protocols and mathematical and algorithmic models tapping the organisation and processing of morphologically complex words, their perceptual correlates, and effects of frequency distribution, paradigm organisation and processing complexity on word recognition, storage and production, in both L1 and L2.

On day two, Michael Zock's contribution "Needles in a haystack and how to find them" addressed the issue of lexical organisation and access as one of the central problems in

daily language production and verbal conceptualization of the external world. According to the invited speaker, our present understanding of how the mental lexicon works can not only help people to overcome tip-of-the-tongue problems and support language production in general, but also assist lexicographers in developing better and more effective dictionaries either in paper or electronic form.

Distributional approaches to the representation of the semantics of words either in isolation or in combination with other words were extensively discussed on day two, including their effects on discovering part-of relations, verb argument selection and complement coercion. Interesting evidence of the correlation between semantic associations discovered through distributional evidence from real corpora, and free associations elicited from human subjects suggested that the underlying semantic structure of the mental lexicon may follow thematic rather than strictly taxonomical principles of lexical organisation.

On day three, in "Content and Organization of Knowledge and its Use in Language Comprehension", Marta Kutas provided an extensive review of electrophysiological work supporting the idea that language processing is immediate and incremental, contextual, sometimes predictive, multi-modal, and bi-hemispheric. The nature of knowledge organisation (associative, categorical, events, perceptuo-motor) and their use in predictive and/or integrative language processing revealed via investigations employing event-related brain potentials (ERPs) is taken to shed considerable light on an integrative view of the mental lexicon, as emerging from the distributed, concurrent interaction of several co-activated brain areas.

The remaining accepted contributions on day three dealt with important neuro-physiological correlates in processing compounds, idiomatic expressions and metaphorical expressions and in word reading, on different languages and with a variety of subject conditions, including high-functioning autism.

The proceedings of the NetWordS Final Conference are being published as an open-access publication available at <http://ceur-ws.org>, with the title "Word Structure and Word Usage: Representations and processes in the Mental Lexicon", edited by Vito Pirrelli, Claudia Marzi, Marcello Ferro.

Part of the success of the event is ascribable to the commitment of a truly interdisciplinary scientific committee, and to the very selective evaluation process each submitted abstract has undergone. The acceptance rate was about one out of two (23 contributions accepted as oral presentations, 19 as posters, out of 84 submissions).

A list of Scientific Committee members follows:

Vito Pirrelli (Programme Chair), Paolo Acquaviva, Sabine Arndt-Lappe, Mark Aronoff, Michel Aurnague, Harald R Baayen, Matthew Baerman, Giosuè Baggio, Valentina Bambini, Marco Baroni, Melanie Bell, Pier Marco Bertinetto, Raymond Bertram, James Blevins, Geert Booij, Myriam Bras, Dunstan Brown, Cristina Burani, Manuel Carreiras, Chiara Celata, Fabian Chersi, Greville Corbett, Walter Daelemans, Mila Dimitrova-Vulchanova, Wolfgang U. Dressler, Jon Andoni Duñabeitia, Karine Duvignau, Hanne Erdman Thomsen, Tomaž Erjavec, Antonio Fábregas, Marcello Ferro, Christina Gagné, Radovan Garabik, Francesco Gardani, Hélène Giraud, Nabil Hathout, Jukka Hyönä, Pia Jarvad, Mélanie Jucla, Mark Keane, Emmanuel Keuleers, Gero Kunter, Minna Lehtonen, Alessandro Lenci, Michele Loporcaro, Hans Christian Luschützky, Martin Maiden, Paola Marangolo, Andrea Marini, William Marslen-Wilson, Claudia Marzi, Nicola Molinaro, Simonetta Montemagni, Fabio Montermini, Costanza Papagno, Carita Paradis, Manuel Perea, Giovanni Pezzulo, Ingo Plag, Csaba Pléh, Mads Poulsen, Gábor Proszeky, Ida Raffaelli, Franz Rainer, Angela Ralli, Hanne Ruus, Magnus Sahlgren, David Saldaña, Martin Schäfer, Thomas Spalding, Marko Tadić, Lorraine K Tyler, Madeleine Voga, Joost Van Der Weijer, Rok Žaucer.

3) Assessment of the results and impact of the event on the future directions of the field (up to two pages)

The interdisciplinary approach to word knowledge and word usage urged by the Conference led participants to focus on an impressive range of approaches and empirical data: priming and lexical decision in a number of contexts, distributional semantics and models of semantic composition, neural networks, machine learning (support vector machines etc.) and mathematical modelling of empirical evidence, as well as neuro-biological and neuro-functional correlates.

Looking at the same problem from different angles has an additive effect on the impact of current language research. Certainly more can be achieved if, rather than adding more perspectives on the same subject, we managed to integrate them into a coherent methodological approach. If psycholinguistic evidence from humans were replicated algorithmically through a computational model implementing a few well-understood principles of time-series processing, we may be in a position to empirically assess what input conditions favour memorisation and acquisition of symbolic strings by the model, and be able to test these algorithmic predictions back on human subjects, thus going full circle. This may have a multiplicative effect on current research, providing not only mathematical modelling of present behavioural evidence, but amounting to fully explanatory mechanisms that can shed light on WHERE and WHEN some cognitive processes are implemented in the brain, and also on HOW they come about.

Interdisciplinarity cannot be decoupled from theoretical modelling and careful analysis of available empirical evidence. Any truly interdisciplinary effort must take advantage of the

numerous methodological caveats that psycholinguists, neurolinguists, theoretical and cognitive linguists, historical linguists, typologists and computational linguists have developed over many years of relatively independent work. Integration of their data and approaches means more complex, more constrained, explanatory and comprehensive models than any other account put forward so far.

There is general consensus that joining forces in this research domain will not only lead to considerable progress in our theoretical understanding of the physiology of communication, but will also be conducive to more effective ways to help real people engaged in their daily communicative exchanges. Integrating data analysis and mining with sound theoretical insights and bio-engineering and computer technologies will be instrumental in developing assistive tools in as diverse language-related areas as:

- multilingualism and cultural integration, namely language acquisition in L1 and L2 contexts and the importance of input and socio-economic factors;
- language as key to knowledge access and knowledge acquisition;
- language teaching and language learning at school;
- diagnostic and therapeutic protocols for language disorders;
- language, effective accessible communication and creative thinking;
- language and cognitive well-being (novel diagnostic protocols for cognitive disorders and disturbances, e.g. in elderly people, autistic children, dyslexics etc.).

4) Annexes 4a) and 4b): Programme of the meeting and full list of speakers and participants

Annex 4a: Programme of the meeting

Day one: 30th March

- 9:00 **Official address:** Milena Žic-Fuchs, Pier Marco Bertinetto, Vito Pirrelli
- 9:30 **Invited talk:** Wolfgang U. Dressler “Psycholinguistic illusions in and on morphology”
- 10:30 **coffee-break**
- 11:00 Olivier Bonami & Sarah Beniamine “Implicative structure and joint predictiveness”
- 11:30 Emmanuel Keuleers, Paweł Mandera, Michaël Stevens & Marc Brysbaert “Of crowds and corpora: A marriage of measures”
- 12:00 Reza Falahati & Chiara Bertini “Perception of gesturally distinct consonants in Persian”
- 12:30 **Poster introduction** (see detailed list - 1-9)
- 13:00 **lunch**
- 14:00 **Poster section (1-9)**
- 15:00 **Invited talk:** Gabriella Vigliocco “The bridge of iconicity: from a world of experience to experience of language”
- 16:00 Héléne Giraudo & Madeleine Voga “Words matter more than morphemes: Evidence from masked priming with bound-stem stimuli”
- 16:30 Giulia Bracco, Basilio Calderone & Chiara Celata “Phonotactic probabilities in Italian simplex and complex words: a fragment priming study”
- 17:00 **coffee-break**
- 17:30 Jim Blevins, Petar Milin & Michael Ramscar “Zipfian discrimination”
- 18:00 Gero Kunter “Effects of processing complexity in perception and production. The case of English comparative alternation”
- 18:30 Claudia Marzi, Marcello Ferro & Vito Pirrelli “Lexical emergentism and the “frequency-by-regularity” interaction”
- 19:00 **Steering Committee Meeting**
- 21:00 **dinner**

Poster section – day one (1-9)

- Pier Marco Bertinetto, Chiara Celata & Luigi Talamo “Morphotactic effects on the processing of Italian derivatives”
- Tatiana Iakovleva, Anna Piasecki & Ton Dijkstra “Are you reading what I am reading? The impact of contrasting alphabetic scripts on reading English”
- Dániel Czégel, Zsolt Lengyel & Csaba Pléh “A study of relations between associative structure and morphological structure of Hungarian words”
- Héléne Giraudo & Serena Dal Maso “Suffix perceptual salience in morphological processing: evidence from Italian”
- Héléne Giraudo & Karla Orihuela “Visual word recognition of morphologically complex words: Effects of prime word and root frequency”
- Jana Hasenäcker, Elisabeth Beyersmann & Sascha Schroeder “Language proficiency moderates morphological priming in children and adults”
- Natalia Slioussar & Anastasia Chuprina “Grouping Morphologically Complex Words in the Mental Lexicon for Russian Verbs and Nouns”
- Radovan Garabík & Radoslav Brída “Extraction and Analysis of Proper Nouns in Slovak Texts”
- Alessandro Lenci, Gianluca Leboni, Marco Senaldi, Sara Castagnoli, Francesca Masini & Malvina Nissim “Mapping the Constructicon with SYMPATHy. Italian Word Combinations between fixedness and productivity”

Day two: 31st March

- 9:00 **Invited talk:** Michael Zock "Needles in a haystack and how to find them"
- 10:00 Sebastian Padó, Britta Zeller & Jan Šnajder "Morphological Priming in German: The Word is Not Enough (Or Is It?)"
- 10:30 François Morlane-Hondère "What can distributional semantic models tell us about part-of relations?"
- 11:00 **coffee-break**
- 11:30 Ting Zhao & Victoria A. Murphy "Modeling Lexical Effects in Language Production: Where Have We Gone Wrong?"
- 12:00 Jens Fleischhauer "Activating Attributes in Frames"
- 12:30 **Poster introduction** (see detailed list - 10-19)
- 13:00 **lunch**
- 14:00 **Poster section (10-19)**
- 15:00 Melanie J. Bell & Martin Schäfer "Modelling Semantic Transparency"
- 15:30 Haim Dubossarsky, Yulia Tsvetkov, Chris Dyer & Eitan Grossman "Bottom up approach to category mapping and meaning change"
- 16:00 Maria Rosenberg & Ingmarie Mellenius "What NN compounding in child language tells us about categorisation"
- 16:30 **coffee-break**
- 17:00 Fabio Montermini "Using distributional data to explore derivational under-markedness: A study of the event/property polysemy in nominalisation"
- 17:30 Dimitrios Alikaniotis & John N. Williams "A Distributional Semantics Approach to Implicit Language Learning"
- 18:00 Anna Anastasiadis-Symeonidis "Suffixation and the expression of space and time in Modern Greek"
- 18:30 Alessandra Zarcone, Sebastian Padó & Alessandro Lenci "Same Same but Different: Type and Typicality in a Distributional Model of Complement Coercion"
- 20:00 **social dinner**

Poster section – day two (10-19)

- Debela Tesfaye & Carita Paradis "On the use of antonyms and synonyms from a domain perspective"
- Rosario Caballero & Iraide Ibarretxe-Antuñano "From physical to metaphorical motion: A cross-genre approach"
- Ida Raffaelli & Barbara Kerovec "'Taste' and its conceptual extensions: the example of Croatian root kus/kuš and Turkish root tat"
- Javier E. Díaz-Vera "Love in the time of the corpora. Preferential conceptualizations of LOVE in World Englishes"
- Cristina Cacciari, Francesca Pesciarelli, Tania Gamberoni & Fabio Ferlazzo "Is black always the opposite of white? The comprehension of antonyms in schizophrenia and in healthy participants"
- Simon De Deyne & Steven Verheyen "Using network clustering to uncover the taxonomic and thematic structure of the mental lexicon"
- Michael Richter & Jürgen Hermes "Classification of German verbs using nouns in argument positions and aspectual features"
- Maja Anđel, Jelena Radanović, Petar Milin & Laurie Beth Feldman "Processing of cognates in Croatian as L1 and German as L2"
- Nana Huang "A User-Based Approach to Spanish-Speaking L2 Acquisition of Chinese Applicative Operation"
- Camilla Hellum Foyn, Mila Vulchanova & Rik Eshuis "The role of grammar factors and visual context in Norwegian children's pronoun resolution"

Day three: 1st April

- 9:00 **Invited talk:** Marta Kutas "Content and Organisation of Knowledge and its Use in Language Comprehension"
- 10:00 Jukka Hyönä, Minna Koski & Alexander Pollatsek "Identifying existing and novel compound words in Finnish: An eye movement study"
- 10:30 Paolo Canal, Francesca Pesciarelli, Francesco Vespignani, Nicola Molinaro & Cristina Cacciari "Electrophysiological correlates of idioms comprehension: semantic composition does not follow lexical retrieval"
- 11:00 **coffee-break**
- 11:30 Sobh Chahboun, Valentin Vulchanov, David Saldaña, Hendrik Eshuis & Mila Vulchanova "Metaphorical priming in a lexical decision task in high-functioning autism"
- 12:00 Barbara Leone Fernandez, Manuel Perea & Marta Vergara-Martínez "ERP correlates of letter-case in visual word recognition"
- 12:30 **Closing session**
- 13:00 **lunch**

Annex 4b: Full list of speakers and participants

Invited speakers:

Žic-Fuchs Milena
Dressler Wolfgang Ulrich
Vigliocco Gabriella
Zock Michael
Kutas Marta

Speakers and co-authors:

Bertinetto Pier Marco
Pirrelli Vito
Marzi Claudia
Hyönä Jukka
Raffaelli Ida
Garabík Radovan
Giraud H  l  ne
Paradis Carita
Vulchanova Mila
Diaz-Vera Javier E.
Alikaniotis Dimitrios
Cacciari Cristina
Pado Sebastian
Foy Camilla Hellum
Kunter Gero
Chahboun Sobh
Bonami Olivier
Orihuela Karla
Dubossarsky Haim
Huang Yuhsin
Fleischhauer Jens
Zarcone Alessandra
Morlane-Hond  re Fran  ois
Ibarretxe-Antu  ano Iraide
Leone Fernandez Barbara
Cz  gel Daniel
Anastassiadis-Symeonidis Anna
Caballero Rosario
Zhao Ting
De Deyne Simon
Richter Michael
Montermini Fabio
Mandera Paweł
Rosenberg Maria
Calderone Basilio
Falahati Reza
Hasen  cker Jana
Lebani Gianluca
Canal Paolo
Blevins Jim
Sch  fer Martin
Pl  h Csaba
Chuprina Anastasia
Iakovleva Tatiana
Dal Maso Serena
Voga Madeleine
Ferro Marcello
Perea Manuel

Kerovec Barbara
Gemechu Debela Tesfaye
Radanovic Jelena
Vulchanov Valentin
Masini Francesca
Bertini Chiara
Beniamine Sarah
Piasecki Anna
Celata Chiara
Lenci Alessandro
Mellenius Ingmarie
Nissim Malvina
Senaldi Giuseppe
Andel Maja

Participants:

Acquaviva Paolo
Loporcaro Michele
Montemagni Simonetta
Bambini Valentina
Jarvad Pia
Piccinin Sabrina
Borelli Eleonora
Garcia Castro Veronica
Andersen Margrethe Heidemann
Chiba Shoji
Arcara Giorgio
Jensen Jørgen Nørby
Franzon Francesca
Zanini Chiara
Pascoli Matteo
Al-Qenae Mohammed
Mattiello Elisa
Nahli Ouafae
Del Grosso Angelo Mario
Privitera Agata Claudia
Todaro Giuseppina
Spinelli Giacomo
Cacchiani Silvia
Pernice Giuseppe