



2014  
**ICEAL**  
**BOOK OF ABSTRACTS**

**International Conference on  
Eyetracking and Applied Linguistics**

**26-27 September 2014, University of Warsaw**  
*In cooperation with the University of Mainz*



UNIWERSYTET  
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JOHANNES GUTENBERG  
UNIVERSITÄT MAINZ



**ICEAL** 2014  
**CONTENTS**

<b>CONFERENCE PROGRAMME</b>	<b>6</b>
<b>LIST OF ABSTRACTS</b>	<b>12</b>
<b>ABSTRACTS</b>	<b>16</b>

The logo for ICEAL 2014 features a stylized eye icon on the left, composed of a black outer shape and a white inner circle with a black dot. A line with four dots connects the eye to the word "ICEAL". The year "2014" is positioned above the "A". Below "ICEAL" is the text "CONFERENCE PROGRAMME" in a bold, sans-serif font.

**ICEAL** 2014  
**CONFERENCE PROGRAMME**

**26-27 SEPTEMBER 2014, UNIVERSITY OF WARSAW, POLAND**  
*<http://liceal.uni-mainz.de>*

# FRIDAY 26TH

8:15 – 9:15	<b>REGISTRATION</b>	
9:15 – 9:30	<b>OPENING</b> <i>Sambor Grucza &amp; Silvia Hansen-Schirra</i>	
9:30 – 10:30	<b>KEYNOTE</b> <i>Arnt Lykke Jakobsen</i>	
10:30 – 10:40	<b>COFFEE BREAK</b>	
	<b>USABILITY</b> <i>ROOM A</i>	<b>TRANSLATION</b> <i>ROOM B</i>
10:40 – 11:00	<b>SASCHA WOLFER &amp; CAROLIN MÜLLER-SPITZER</b> <i>Evaluation of a New Web Design for the Dictionary Portal OWID</i>	<b>BOGUSŁAWA WHYATT, MARTA KAJZER-WIETRZNY &amp; KATARZYNA STACHOWIAK</b> <i>A Comparative Analysis of Reading Patterns in Interlingual and Intralingual Translation: An Eyetracking Study</i>
11:00 – 11:20	<b>CHRISTOPH RÖSENER</b> <i>Eyetracking and Beyond – The Do's and Don'ts of Creating a Contemporary Usability Lab</i>	<b>MICHAEL CARL &amp; MORITZ SCHAEFFER</b> <i>Literal Translations and Cognitive Effort</i>
11:20 – 11:40	<b>SHAIMAA MARZOUK</b> <i>Web Usability from a Linguistic and Formal Perspective: Applied on the Example of Academic Websites</i>	<b>MAUREEN EHRENSBERGER-DOW, PETER JUD &amp; GARY MASSEY</b> <i>The Cognitive Ergonomics of Translation: Indicators from Eyetracking Data</i>
11:40 – 12:00	<b>ROBERT LEW</b> <i>Eyetracking in Dictionary User Research</i>	<b>ARNDT HEILMANN &amp; TATIANA SERBINA</b> <i>Grammatical Complexity and its Effect on Cognitive Processing in Translation</i>
12:00 – 12:30	<b>DISCUSSION</b>	<b>DISCUSSION</b>
12:30 – 14:00	<b>LUNCH BREAK</b>	

6

	<b>INTERPRETING</b> <i>ROOM A</i>	<b>LANGUAGE ACQUISITION AND PROCESSING</b> <i>ROOM B</i>
14:00 – 14:20	<b>KILIAN G. SEEBER</b> <i>Attentional Shifts during Simultaneous Interpreting</i>	<b>NATALIA ILIN, SASCHA WOLFER, LARS KONIECZNY &amp; BERND KORTMANN</b> <i>Perception of Learner Errors and Nonstandard Features in Native and Non-native Language</i>
14:20 – 14:40	<b>SABINE SEUBERT</b> <i>Cognitive Load, Visual Overload?</i>	<b>EWA TOMCZAK</b> <i>Does Figurative Language make you Look at the World Differently? – Processing of Fictive Motion Sentences in Polish-English Bilinguals</i>
14:40 – 15:00	<b>PAWEŁ KORPAL &amp; KATARZYNA STACHOWIAK</b> <i>How do Simultaneous Interpreters Cope with Numbers in the Fast Speech Condition? An Eyetracking Study</i>	<b>KATARZYNA KOSMOWSKA, AGATA RODZIEWICZ, JUSTYNA IWAŃSKA, AGNIESZKA GAJOS, IZABELA KREJTZ &amp; KRZYSZTOF KREJTZ</b> <i>Comparison of Eye Movements during Text and Music Reading</i>
15:00 – 15:20	<b>ANNE CATHERINE GIESHOFF</b> <i>Visual Input and Mental Effort in Simultaneous Interpreting</i>	<b>ALPER KUMCU</b> <i>Integrating Auditory and Visual Language: An Eyetracking Study on Multimodal Language Processing</i>
15:20 – 15:45	<b>DISCUSSION</b>	<b>DISCUSSION</b>
15:45 – 16:15	<b>COFFEE BREAK</b>	
16:15 – 17:15	<b>KEYNOTE</b> <i>Lars Konieczny</i>	

7

## SATURDAY 27TH

	AUDIOVISUAL TRANSLATION ROOM A	DIVERSITY ROOM B
9:00 – 9:20	<b>AGNIESZKA SZARKOWSKA &amp; IZABELA KREJTZ</b> <i>Age-related Differences in Reading Subtitles: An Eyetracking Study</i>	<b>IGOR ANTONIO LOURENÇO DA SILVA &amp; ADRIANA SILVINA PAGANO &amp; FABIO ALVES</b> <i>Mapping Gaze onto Representations of Text Rhetorical Structure</i>
9:20 – 9:40	<b>David ORREGO-CARMONA</b> <i>Different Audiences, Different Behaviors: On the Reception of Subtitles by Users with Different Levels of L2</i>	<b>Jin HUANG &amp; Akshay MINOCHA</b> <i>A Comparison of the Process and the Product of Translation Self-revision and Other-revision</i>
9:40 – 10:00	<b>MINAKO O'HAGAN &amp; RYOKO SASAMOTO</b> <i>Crazy Japanese Subtitles? – Shedding Light on the Impact of Impact Captions</i>	<b>SILKE GUTERMUTH</b> <i>Lost in Sign Language Interpretation – An Eyetracking Study on the Visual Attention of Hearing Impaired Recipients</i>
10:00 – 10:20	<b>JUHA LÅNG</b> <i>Comparison between People from a Dubbing vs. a Subtitling Country in the Comprehension of a Television Documentary</i>	<b>ANNEGRET STURM</b> <i>Through Others' Eyes</i>
10:20 – 10:40	<b>WENDY FOX</b> <i>Reception, Information Flow and Aesthetics: Integrated Titles and other Possible Improvements</i>	
10:40 – 11:05	<b>DISCUSSION</b>	<b>DISCUSSION</b>
11:05 – 11:20	<b>COFFEE BREAK</b>	

8

	POST-EDITING MACHINE TRANSLATION ROOM A	READING ROOM B
11:20 – 11:40	<b>FABIO ALVES et al.</b> <i>Investigating Cognitive Effort in Post-Editing: A Relevance-Theoretic Approach</i>	<b>SASCHA WOLFER &amp; SANDRA HANSEN-MORATH &amp; LARS KONIECZNY</b> <i>Investigating the Impact of Nominalisations on the Reading Process: A Case Study Using the Freiburg Legalese Reading Corpus</i>
11:40 – 12:00	<b>MORITZ SCHAEFFER, MICHAEL CARL, MERCEDES GARCÍA MARTÍNEZ &amp; BARTOLOMÉ MESA-LAO</b> <i>Tracking Post-Editing Performance with CASMACAT 3.0</i>	<b>DOMINIKA MAWDUK, IZABELA KREJTZ &amp; KRZYSZTOF KREJTZ</b> <i>How do the Polish Dyslexic Children read? Eyetracking Study of Reading Styles among 10-15 Year-old Children with and without Dyslexia</i>
12:00 – 12:20	<b>JEAN NITZKE</b> <i>Human Translation vs. (Post-) Editing: A look at Conscious Problem-solving Strategies (Internet Research)</i>	<b>DANIEL MÜLLER-FELDMETH, ULI HELD, SASCHA WOLFER &amp; LARS KONIECZNY</b> <i>Influence of Discourse Functions on Reading Comprehension: Evidence from a German Reading Corpus of Popular Science Texts</i>
12:20 – 12:40		<b>KARIN MAKSYMSKI, SILKE GUTERMUTH &amp; SILVIA HANSEN-SCHIRRA</b> <i>Reading Popular Science: The Influence of Text Image Coherence on Reading Behaviour</i>
12:40 – 13:00	<b>DISCUSSION</b>	<b>DISCUSSION</b>
13:00 – 13:30	<b>CLOSING</b>	
13:30	<b>BRUNCH</b>	

9



26-27 SEPTEMBER 2014, UNIVERSITY OF WARSAW, POLAND  
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	<b>USABILITY</b>	<b>16</b>			
	<b>SASCHA WOLFER / CAROLIN MÜLLER-SPITZER</b> <i>Evaluation of a New Web Design for the Dictionary Portal OWID</i>	16		<b>PAWEŁ KORPAL / KATARZYNA STACHOWIAK</b> <i>How do Simultaneous Interpreters Cope with Numbers in the Fast Speech Condition? An Eye-tracking Study</i>	36
	<b>CHRISTOPH RÖSENER</b> <i>Eye Tracking and Beyond – The Do’s and Don’ts of Creating a Contemporary Usability Lab</i>	18		<b>ANNE CATHERINE GIESHOFF</b> <i>Visual Input and Mental Effort in Simultaneous Interpreting</i>	38
	<b>SHAIMAA MARZOUK</b> <i>Web Usability from a Linguistic and Formal Perspective: Applied on the Example of Academic Websites</i>	20		<b>LANGUAGE ACQUISITION AND PROCESSING</b>	<b>40</b>
	<b>TRANSLATION</b>	<b>22</b>		<b>NATALIA ILIN / SASCHA WOLFER / LARS KONIECZNY / BERND KORTMANN</b> <i>Perception of Learner Errors and Nonstandard Features in Native and Non-native Language</i>	40
	<b>ROBERT LEW</b> <i>Eyetracking in Dictionary User Research</i>	22		<b>EWA TOMCZAK</b> <i>Does Figurative Language Make you Look at the World Differently? – Processing of Fictive Motion Sentences in Polish-English Bilinguals</i>	42
12	<b>BOGUSŁAWA WHYATT / MARTA KAJZER-WIETRZNY / KATARZYNA STACHOWIAK</b> <i>A Comparative Analysis of Reading Patterns in Interlingual and Intralingual Translation: An Eye Tracking Study</i>	24		<b>KATARZYNA KOSMOWSKA / AGATA RODZIEWICZ / JUSTYNA IWAŃSKA / AGNIESZKA GAJOS / IZABELA KREJTZ</b> <i>Comparison of Eye-movements During Text and Music Reading</i>	44
	<b>MICHAEL CARL / MORITZ SCHAEFFER</b> <i>Measuring the Cognitive Effort of Literal Translation Processes</i>	26		<b>ALPER KUMCU</b> <i>Integrating Auditory and Visual Language: An Eye Tracking Study on Multimodal Language Processing</i>	46
	<b>MAUREEN EHRENSBERGER-DOW / PETER JUD / GARY MASSEY</b> <i>The Cognitive Ergonomics of Translation: Indicators from Eyetracking Data</i>	28		<b>AUDIOVISUAL TRANSLATION</b>	<b>48</b>
	<b>ARNDT HEILMANN / TATJANA SERBINA</b> <i>Grammatical Complexity and its Effect on Cognitive Processing in Translation</i>	30		<b>AGNIESZKA SZARKOWSKA / IZABELA KREJTZ</b> <i>Age-related Differences in Reading Subtitles: An Eyetracking Study</i>	48
	<b>INTERPRETING</b>	<b>32</b>		<b>DAVID ORREGO-CARMONA</b> <i>Different Audiences, Different Behaviors: On the Reception of Subtitles by Users with Different Levels of L2</i>	50
	<b>KILIAN G. SEEBER</b> <i>Attentional Shifts during Simultaneous Interpreting</i>	32		<b>MINAKO O’HAGAN / RYOKO SASAMOTO</b> <i>Crazy Japanese Subtitles? – Shedding Light on the Impact of Impact Captions</i>	52
	<b>SABINE SEUBERT</b> <i>Cognitive Load, Visual Overload?</i>	34			

	<b>JUHA LÅNG</b>			
	<i>Comparison between People from a Dubbing vs. a Subtitling Country in the Comprehension of a Television Documentary</i>	54		
	<b>WENDY FOX</b>			
	<i>Reception, Information Flow and Aesthetics: Integrated Titles and other Possible Improvements</i>	56		
	<b>DIVERSITY</b>	<b>58</b>		
	<b>IGOR ANTONIO LOURENÇO DA SILVA / ADRIANA SILVINA PAGANO / FABIO ALVES</b>			
	<i>Mapping Gaze onto Representations of Text Rhetorical Structure</i>	58		
	<b>JIN HUANG / AKSHAY MINOCHA</b>			
	<i>A Comparison of the Process and the Product of Translation Self-revision and Other-revision</i>	60		
	<b>SILKE GUTERMUTH</b>			
14	<i>Lost in Sign Language Interpretation – An Eyetracking Study on the Visual Attention of Hearing-impaired Recipients</i>	62		
	<b>ANNEGRET STURM</b>			
	<i>Through Others' Eyes</i>	64		
	<b>POST-EDITING MACHINE TRANSLATION</b>	<b>66</b>		
	<b>FABIO ALVES / MARCELI AQUINO / NORMA FONSECA / JOSÉ LUIZ GONÇALVES / ARLENE KOGLIN / KYOKO SEKINO / KARINA SZPAK</b>			
	<i>Investigating Cognitive Effort in Post-editing: A Relevance-theoretic Approach</i>	66		
	<b>MORITZ SCHAEFFER / MICHAEL CARL / MERCEDES GARCÍA MARTÍNEZ / BARTOLOMÉ MESA-LAO</b>			
	<i>Tracking Post-editing Performance with CASMACAT 3.0</i>	68		
	<b>JEAN NITZKE</b>			
	<i>Human Translation vs. (Post-)Editing: A look at Conscious Problem-solving Strategies (Internet Research)</i>	70		
	<b>READING</b>			<b>72</b>
	<b>SASCHA WOLFER / SANDRA HANSEN-MORATH / LARS KONIECZNY</b>			
	<i>Investigating the Impact of Nominalisations on the Reading Process: A Case Study using the Freiburg Legalese Reading Corpus</i>		72	
	<b>DOMINIKA MAWDUK / IZABELA KREJTZ / KRZYSTOF KREJTZ</b>			
	<i>How do Polish Dyslexic Children Read? Eye-tracking Study of Reading Styles among 10-15 Years Old Children with and without Dyslexia</i>		74	
	<b>DANIEL MÜLLER-FELDMETH / ULI HELD / SASCHA WOLFER / LARS KONIECZNY</b>			
	<i>Influence of Discourse Functions on Reading Comprehension: Evidence from a German Reading Corpus of Popular Science Texts</i>		76	
	<b>KARIN MAKSYMYSKI / SILKE GUTERMUTH / SILVIA HANSEN-SCHIRRA</b>			
	<i>Reading Popular Science: The Influence of Text-image Coherence on Reading Behaviour</i>		78	15



# EVALUATION OF A NEW WEB DESIGN FOR THE DICTIONARY PORTAL OWID

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The main aim of our study was to evaluate eye-tracking as a form of data collection about dictionary use as eye-tracking is – at least for research into dictionary use – a new and not widely used technology providing access to the low-level processes during dictionary usage. We decided to evaluate the new web design of the dictionary portal OWID ([www.owid.de](http://www.owid.de)), a portal integrating several academic monolingual dictionaries of German, hosted at the Institute for German Language in Mannheim. In the mid of 2011, when the study was conducted, the relaunch of the web design was internally finished but not available to the public yet. Hence, it was a good time to investigate how users get along with the new design decisions. We addressed e.g. the following questions in our study:

- Is it easy to see that OWID is a dictionary portal, i. e. that different dictionaries are integrated into OWID?
- Does the colour scheme work for the identification of the individual dictionaries; i. e. is it easy to assign keywords to the individual dictionaries by the coloured boxes introduced for this purpose?
- How are new elements of the inner access structure evaluated? In particular, are items easy to locate due to the less cluttered screen layout, and do the participants understand the simultaneous presentation of the sense-label and the definition in *lexiko* (one of the dictionaries integrated in OWID)?

38 persons participated in our study, all of them students aged 20-30 years. Besides the results of our study, we will also present critical comments on methodological as-

pects. Furthermore, we will provide examples of how eye tracking data can be used to investigate the time course of perceiving and understanding dictionary entries.

## KEYWORDS

design evaluation, lexicography, usability studies, reception studies

## USABILITY

10:40 – 11:00

FRIDAY 26TH

ROOM A

# EYE TRACKING AND BEYOND – THE DO'S AND DON'TS OF CREATING A CONTEMPORARY USABILITY LAB

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Difficulties and problems implementing a sustainable technical architecture for a scientific research environment.

Many research facilities and institutions contemplate the idea of establishing an eye tracking laboratory or an even more extensive usability lab for their own. But from the initial idea to a successful creation of such a project there are lots of difficulties and problems to solve. Starting from room size and arrangement, techniques used, devices to purchase, necessary software up to the planned methods to be used (cf. 1), there are many questions to answer during the conception and construction of such a laboratory. Despite this, eye tracking as the major technique in usability research has become more sophisticated and complex over the recent years. Moreover in usability laboratories additional equipment is needed, which in many cases has to interact with the eye tracking devices. All these are obstacles to overcome in the process of creating an eye tracking or usability laboratory.

In the present paper I will try to approach these problem issues from various points of view, showing the do's and don'ts in the process of establishing such a laboratory. First of all I will give a brief overview about modern eye tracking equipment now available on the market. Several eye tracking systems are presented as well as additional devices necessary for the task. This is then followed by a description of the latest possible design concepts for usability laboratories in general. Connected with this classical and new methods for usability research (TAP, camera observation, eye tracking, keyboard logging etc.) are discussed. Finally I will describe the difficulties and problems deploying an eye tracking laboratory for usability studies of translation tools and terminology systems (cf. 2).

## **USABILITY**

FRIDAY 26TH

**11:00 – 11:20**

ROOM A

The paper ends with a presentation of an existing usability laboratory at Flensburg University of Applied Sciences.

- [1] Dumas, Joseph S. / Redish, Janice C. (1999): *A Practical Guide To Usability Testing*. Revised Edition. Intellect Books: Exeter.
- [2] Hansen-Schirra, S. / Rösener, C. (2013): "Proactive Use of Eye-Tracking in the Translational Workflow." In: Gruzca, S. / Pluzyczka, M. / Zajac, J.: *Translation Studies and Eye-Tracking Analysis*. Peter Lang.

# WEB USABILITY FROM A LINGUISTIC AND FORMAL PERSPECTIVE: APPLIED ON THE EXAMPLE OF ACADEMIC WEBSITES

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20 Optimal web usability is vital for survival in the internet world. Internet users will leave a website within seconds, if they cannot quickly find the information required or if they cannot easily understand the information provided. As a result, both design and content aspects are essential in the assessment of web usability. The examination of usability technical literature shows that usability guidelines vary widely in terms of scope and suitability. Despite its significance, analyzing web usability from a linguistic perspective is rarely devoted the attention it deserves in usability evaluations. Most of these evaluations focus instead on design and technical aspects. Against this background, the goal of this study is to investigate web usability from both a linguistic and a formal perspective. On a linguistic level, the study introduces the concept Linguistic Web Usability and analyzes web usability applying the theory of signs by C. Morris. Based on this linguistic analysis as well as a literature review of a large number of web usability guidelines, a categorized list of criteria was developed that covers both the linguistic and formal aspects of web usability. Furthermore, this list of criteria was empirically applied within a usability study to evaluate the new design of the Johannes Gutenberg University Mainz website. The testing methods employed in this usability study were Eye Tracking in combination with Think Aloud and Retrospective Think Aloud. The results of the empirical study show that linguistic usability problems just like formal problems hinder users from finding relevant information, or at least slow down their search. The linguistic perspective should therefore be an integral part of usability guidelines.

## KEYWORDS

Web Usability, Usability Testing, Usability Criteria, Eye

## USABILITY

FRIDAY 26TH

11:20 – 11:40

ROOM A

Tracking, Hypertext, Linguistic Analysis, Linguistic Web Usability, The Theory of Signs, Semiotics, Syntactics, Semantics, Pragmatics.

- Isakson, Carol S. / Spyridakis, Jan H. (2003): "The Influence of Semantics and Syntax on What Readers Remember." In: *Technical Communication*, 50 (4), 538, 553.
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- Rubin, Jeffrey (1994): *Handbook of Usability Testing: How to Plan, Design, and Conduct Effective Tests*. New York, USA: John Wiley & Sons, Inc.
- Schröder, Hartmut (1993): „Semiotische Aspekte multimedialer Texte.“ In: Schröder, Hartmut [ed.]: *Fachtextpragmatik*. Tübingen: Narr, 189-213.
- Schütte, Daniela (2004): *Homepages im World Wide Web: Eine interlinguale Untersuchung zur Textualität in einem globalen Medium*. Frankfurt: Peter Lang.

# EYETRACKING IN DICTIONARY USER RESEARCH

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Recent advances in eye-movement research have made it possible to study the process of dictionary consultation at a level of detail unavailable with other techniques. An important advantage of the eyetracking technique is that it requires no special action from the dictionary user, unlike traditional techniques so far employed in dictionary user research, such as underlining or verbalizing (such as in the thinking aloud protocol). Interest in eyetracking in dictionary user research started merely a few years ago, with only a small number of exploratory studies available so far (Kaneta, 2011; Simonsen, 2009a, 2009b, 2011; Tono, 2011). In my paper I aim to report on a study of Polish learners of English who were asked to consult bilingual Polish-to-English entries for the meaning of a less frequent sense or phrase of a fairly common vocabulary item embedded in an English sentence. I will examine typical visual scanning patterns for dictionary pages and entries, and also verify whether semantic guiding elements supplied in bilingual entries of the more sophisticated dictionaries, in an attempt to guide dictionary users to the appropriate sense, actually help users in ways envisaged by lexicographers.

## USABILITY

FRIDAY 26TH

**11:40 – 12:00**

ROOM A

22

23

Kaneta, T. (2011): "Folded or unfolded: Eye-tracking analysis of L2 learners' reference behavior with different types of dictionary." In: Akasu, K. / Uchida, S. [eds.]: *ASIALEX2011 Proceedings Lexicography: Theoretical and Practical Perspectives*. Kyoto: Asian Association for Lexicography, 219-224.

Simonsen, H. K. (2009a): *Se – og du skal finde: en eyetracking-undersøgelse med særlig fokus på de leksikografiske funktioner Nordiske studier i leksikografi 11*. Rapport fra Konference om leksikografi i Norden. Finland 3.-5. juni 2009. Tampere: Nordisk forening for leksikografi, 274-288.

Simonsen, H. K. (2009b): *Vertical or horizontal? That is the question: An eye-track study of data presentation in internet dictionaries*. Paper presented at the Eye-to-IT conference on translation processes, Copenhagen Business School, Denmark.

Simonsen, H. K. (2011): "User Consultation behaviour in internet dictionaries: An eye-tracking study." In: *Hermes*, 46, 75-101.

Tono, Y. (2011): "Application of eye-tracking in EFL learners' dictionary look-up process research." In: *International Journal of Lexicography*, 24(1), 124-153.

# A COMPARATIVE ANALYSIS OF READING PATTERNS IN INTERLINGUAL AND INTRALINGUAL TRANSLATION: AN EYE TRACKING STUDY

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typed their target texts. The analysis of the recorded data focused on indicators of cognitive effort which were investigated by Jakobsen and Jensen (2008) and Alves et al. (2011) and which included fixation count and fixation length. We also analyzed regressions as valid indicators of intense language processing. The data were analyzed against the psycholinguistic accounts of lexical access and lexical selection in bilingual memory research. An attempt was made to correlate the eye-tracking data with the typing process of target texts recorded in Translog, with the target texts as a product and with the translation experience of the participants.

The classification of translation as an activity involving a re-expression of meaning in a different form than the one it was originally encoded in, provided by Jakobson (1959), has become a fundamental concept in Translation Studies. However, with the main focus on interlingual translation, investigating intralingual translation (paraphrase) and intersemiotic translation has been rarely taken up in empirical research. In this presentation we would like to share our preliminary findings concerning a comparative analysis of cognitive effort when reading a text for translation and paraphrase (Shreve et al. 1993). The experiment is part of a pilot study carried out to test research methodology designed for the ParaTrans project financed by the Polish National Science Centre whose aim is to investigate decision-making processes in translation and paraphrase. This study addressed a question whether the task purpose (translating or paraphrasing) is reflected in the reading behavior of translation trainees and professional translators. The experimental task involved reading a short text and translating or paraphrasing it in Translog (Jakobsen 2011). To eliminate any unnecessary movement away from the screen which would compromise accurate data collection by the eye-tracking system (Eyelink 1000 Plus), the subjects were first asked to read the SL text and then they

## TRANSLATION

FRIDAY 26TH

**10:40 – 11:00**

ROOM B

- Alves, F. A. Pagano / Da Silva, I. (2011): "Towards an investigation of reading modalities in/for translation: an exploratory study using eye-tracking data". In: O'Brien, Sh. [ed.]: *Cognitive Explorations of Translation*. London: Continuum, 175-196.
- Jakobsen, Arnt L. (2011): "What's in the eye of translators? – Translog with eyetracking". In: Schmitt, Peter / Herold, Susann / Weilandt, Anette [eds.]: *Translationsforschung: Tagungsberichte der LICTRA IX*. Frankfurt am Main: Peter Lang, 343-353.
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- Shreve, G.M. / Schäffner, C. / Danks, J.H. (1993): "Is there a special kind of 'reading' for translation: an empirical investigation of reading in the translation process". In: *Target* 5(1): 21-41.

# MEASURING THE COGNITIVE EFFORT OF LITERAL TRANSLATION PROCESSES

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In the translation process literature, it is controversial what it means for a translation to be literal. Chesterman suspects that “translators tend to proceed from more literal versions to less literal ones” (Chesterman, 2011: 28) and speculates that “a literal translation is one that shows maximum formal correspondence”. In this paper we define “formal translation” to be one that is produced by a formal system (i.e. a machine translation system), and define literality in line with (Krzyszowski, 1990: 135) as consisting “of the same number of lexical words, representing equivalent grammatical categories, arranged in the same literal order” by the following three criteria:

1. Word order is identical in the source and target languages
2. Source and target text items correspond one-to-one
3. No different translation choices are observed in alternative translations.

Machine translation can thus be more or less literal, but it is unclear how MT quality correlates with translation literality. We investigate the literality definition from two angles measuring: (i) the local distortion of the source and the target text word order and (ii) the entropy of word translation realizations in sets of human (post-edited) machine translation output. We correlate the edit distance with post-editing effort (gaze and translation duration) as well as with the literality of the post-edited translations. We also correlate the entropy of word transition probabilities in the MT search graph with the entropy of the post-edited product. The findings can be summarized as follows:

## TRANSLATION

FRIDAY 26TH

**11:00 – 11:20**

ROOM B

- The effort of the post-editor correlates positively with the edit distance between the MT output and the post-edited version of the text. The more a post-editor modifies a segment, the less time is needed for reviewing.
- Human word translation entropy correlates with gaze duration on (and translation production time of) the translation: it is more time consuming for a translator to translate a source language word which can be translated in various different ways, than a source word which can only be translated into one of small number of different target words, with high probability.
- Human word translation entropy correlates with machine word translation entropy: if post-editors translate a source word in many different ways, the SMT system also has many translation options for that word.
- Entropy of translation transitions in the MT search graph correlates with post-editing durations: the higher the entropy in the MT search graph, the higher is also the post-editing time.

The findings suggest that an entropy threshold might be determined in transitions of the MT search graph that indicates the suitability of the MT output for post-editing.

# THE COGNITIVE ERGONOMICS OF TRANSLATION: INDICATORS FROM EYE-TRACKING DATA

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28

The classification of translation as an activity involving a re-expression of meaning in a different form than the one it was originally encoded in, provided by Jakobson (1959), has become a fundamental concept in Translation Studies. However, with the main focus on interlingual translation, investigating intralingual translation (paraphrase) and intersemiotic translation has been rarely taken up in empirical research. In this presentation we would like to share our preliminary findings concerning a comparative analysis of cognitive effort when reading a text for translation and paraphrase (Shreve et al. 1993). The experiment is part of a pilot study carried out to test research methodology designed for the ParaTrans project financed by the Polish National Science Centre whose aim is to investigate decision-making processes in translation and paraphrase. This study addressed a question whether the task purpose (translating or paraphrasing) is reflected in the reading behavior of translation trainees and professional translators. The experimental task involved reading a short text and translating or paraphrasing it in Translog (Jakobsen 2011). To eliminate any unnecessary movement away from the screen which would compromise accurate data collection by the eye-tracking system (Eyelink 1000 Plus), the subjects were first asked to read the SL text and then they typed their target texts. The analysis of the recorded data focused on indicators of cognitive effort

## TRANSLATION

FRIDAY 26TH

11:20 – 11:40

ROOM B

which were investigated by Jakobsen and Jensen (2008) and Alves et al. (2011) and which included fixation count and fixation length. We also analyzed regressions as valid indicators of intense language processing. The data were analyzed against the psycholinguistic accounts of lexical access and lexical selection in bilingual memory research. An attempt was made to correlate the eye-tracking data with the typing process of target texts recorded in Translog, with the target texts as a product and with the translation experience of the participants.

29

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# GRAMMATICAL COMPLEXITY AND ITS EFFECT ON COGNITIVE PROCESSING IN TRANSLATION

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The area of process-based translation studies investigates how translations unfold over time as well as the effect of various factors both on the translation process and product. Examples of factors that have been considered are the translator's expertise (e.g. Carl et al. 2011) and time pressure (e.g. Hvelplund 2011). The present study aims at exploring a linguistic feature of grammatical complexity to determine whether cognitive processing differs depending on 1) translation of grammatically more or less complex stretches of the source text, and 2) changes in the level of grammatical complexity between the original and the corresponding parts of the target text. Grammatical complexity is assumed to vary based on whether the same semantic process is expressed through a clause (simple variant) or a noun phrase (complex variant) (e.g. Steiner 2002, Hansen 2003, Alves et al. 2010).

The translation experiment reported in this talk involves two versions of an abridged source text with ten integrated stimuli: one version contains five simple and five complex passages, which are counterbalanced in the other text version. These local text modifications increase control over confounding factors, while preserving the ecological validity of the experiment. Subjects have translated the assigned version from English into German (their native language). Their gaze movements have been recorded using the remote eye tracker Tobii TX300, while the software Translog II has been employed to collect information on all the keystrokes and mouse movements during the translation process. Results of the study will be discussed with a special focus on the eye-tracking data.

**TRANSLATION**

FRIDAY 26TH  
**11:40 – 12:00**  
ROOM B

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# ATTENTIONAL SHIFTS DURING SIMULTANEOUS INTERPRETING

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Attentional mechanisms during simultaneous interpreting are difficult to measure given the real-time nature of the task and the fact that comprehension and production process temporally overlap. Based on a strong mind-eye hypothesis (Just and Carpenter, 1980) this experiments uses the visual world paradigm (Alopenna et al., 1998) to measure shifts in visual attention (Wright and Ward, 2008) as modulated by verbal input and output during a comprehension, a production and a simultaneous interpreting task.

## **INTERPRETING**

FRIDAY 26TH

**14:00 – 14:20**

ROOM A

- 32** A group of professional interpreters and a group of bilingual controls performed three tasks: a sentence comprehension task, a cued sentence production task, and a simultaneous interpreting task. The stimulus materials consisted of short sentences of the type “the X is next to the y” and were accompanied visual scenes containing the image of the two targets (x and y) and a distractor (z). A time-locked analysis of the verbal input (during comprehension), the verbal output (during production) or both (during simultaneous interpreting) on one hand, and the fixations on the visual targets on the other, will allow us to carry out a temporal analysis of attentional shifts during the three tasks and compare them across the two groups.

**33**

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# COGNITIVE LOAD, VISUAL OVERLOAD?

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34 When it comes to modeling the interpreting process and its sub-processes, visual information is often mentioned as being part of the input to be processed (cf. Kirchhoff 1976; Stenzl 1983; Pöchhacker 1994; Feldweg 1996; Setton 1999; Moser 2002; Andres 2012). Opinions on their relevance for processing operations, however, differ, especially concerning simultaneous interpreting. Although interpreters have always insisted on a good view on the conference room, the speaker and/or projection screen, telephone interpreting without any visual input also works (cf. Kelly 2008). Visual information has situational relevance, contributes to comprehending the incoming messages, and can even affect the interpreter's prosody (cf. Liedke 2012). Today's multimedia conference settings require high degrees of cross-modal attention: while observing the speakers gestures and facial expressions, presentations with short text passages, diagrams, columns of figures etc. have to be followed, to which researching technical terms in one's own glossary or online is added. At the same time, the SL message is to be delivered fluently and accurately into the TL. This requires highly focused attention which is, however, prone to distractions. This susceptibility to distraction depends on the interpreter's expertise/experience and the difficulty of a given source text. Therefore, it is contingent on individual resource management since different auditory and visual stimuli compete for limited cognitive resources. Only recently have first Eye Tracker studies on visual input in simultaneous interpreting been carried out, e.g. on the processing of figures (Seeber 2012) or language combination related sight translation (Korpál 2012). My study investigates how attention is allocated to different sources of visual input, what kind of situational stimuli remain unattended, whether visual overload exists, and whether such overload may cause problems in the interpreting process. My presentation will deal with the results of the study's preparatory tests.

## INTERPRETING

FRIDAY 26TH

14:20 – 14:40

ROOM A

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35

# HOW DO SIMULTANEOUS INTERPRETERS COPE WITH NUMBERS IN THE FAST SPEECH CONDITION? AN EYE-TRACKING STUDY

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36 Simultaneous interpreting (SI) is frequently perceived as one of the most challenging language tasks (Christoffels and de Groot 2005) the difficulty of which may be greatly influenced by the speed of speech delivery. Meanwhile, numerical data processing is particularly problematic in SI since numbers are characterised by low predictability, low redundancy and high informative content (Mazza 2001). Interpreters themselves report that access to visual materials may reduce the cognitive load related to information storage in the working memory and improve number interpreting.

The main purpose of the present study was to investigate whether the speed of speech delivery influences the extent to which interpreters use visual materials containing numerals. Our preliminary research showed that access to visual materials did facilitate number interpreting. However, in this study we hypothesised that this type of facilitation is subject to the speed of delivery, i.e. when the speech rate is high, additional visual processing may increase the cognitive load instead of reducing it. Thus, interpreters may rely exclusively on auditory data. In the present experiment a group of interpreters was asked to interpret four speeches in the simultaneous mode. We manipulated two independent variables: access to visual materials (access/no access) and the speed of delivery (fast/slow). Analysis of data from the EyeLink II eye-tracker and the qualitative analysis of the interpreters' performance made it possible to state whether visual processing is also applied by simultaneous interpreters in the event of a fast speaker.

**INTERPRETING**

FRIDAY 26TH

**14:40 – 15:00**

ROOM A

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# VISUAL INPUT AND MENTAL EFFORT IN SIMULTANEOUS INTERPRETING

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It is widely agreed that conference interpreters rely not only on what they hear, but also on what they see. Sources of visual input like lip movements, gestures, facial expressions, presentation slides, and conference documentation provide interpreters with crucial cues to the meaning of what is being said. Studies on remote interpreting have shown that interpreters experience more stress and fatigue if their visual input is limited due to externally controlled video settings (Moser-Mercer 2003). In contrast, Rennert found no major effect on performance when the interpreters' view was blocked. These findings suggest that while lack of visual contact may not directly affect interpreting performance, it seems to increase mental effort. Furthermore, several studies have shown that multimodal integration of stimuli enhances response accuracy and reaction time (Groh/Werner-Reiß 2002). Accordingly, matching auditory and visual stimuli, such as speech audio and lip movements, should decrease mental effort leading to a facilitation effect during interpreting

To analyze mental effort during interpreting with and without visual input, the present study will track pupil size measures. This method was first proposed by Beatty (1982) and later confirmed for interpreting by Hyöna, Tommola, and Alaja (1995). Professional interpreters will be asked to interpret simultaneously six texts of approximately five minutes, three with video, three without. A pretest demonstrated that pupil dilation varies with high speaking rate or poor sound quality. In order to further explore this phenomenon, one text in each block is particularly fast, and a second one has poor sound quality, the third text is for control. The results will indicate whether visual input has a beneficial impact on interpreting and to what extent it differs under severe conditions.

## INTERPRETING

FRIDAY 26TH

15:00 – 15:20

ROOM A

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# PERCEPTION OF LEARNER ERRORS AND NONSTANDARD FEATURES IN NATIVE AND NON-NATIVE LANGUAGE

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40

An eye-tracking experiment revealed how native and non-native speakers of English react to dialect features and learner errors. Mixed-effects models analyze whether the reading time at the affected region depends on the locality, frequency, complexity, speaker, part of speech, or other properties of the errors. The results are also examined within the subject groups: for native speakers, based on their variety (AmE, BrE, CanE); for non-native speakers (German learners), based on their language proficiency. The aim is to find out the error types and the circumstances which cause significant delay in the processing time.

Among other things, it has been shown that learners are significantly slower than native speakers; errors indeed cause delay in the reading time, but not all; an error involving more frequent items complicates processing; the easiest errors are those involving one word (e.g. spelling), the most disturbing errors involve two adjacent words (e.g. agreement), then as the distance grows the processing cost subsides; non-native speakers are generally more sensitive to the 'wrong' word image, whereas native speakers read easily as long as it 'sounds right'; native

speakers have a hard time processing learner errors (EFL, ESL), whereas non-native speakers struggle more with nonstandard features (L1, ESL); omissions (deletions) and substitutions are easier to process than additions (insertions) and reordering; higher language proficiency results in faster reading time.

## LANGUAGE ACQUISITION AND PROCESSING

FRIDAY 26TH

**14:00 – 14:20**

ROOM B

41

# DOES FIGURATIVE LANGUAGE MAKE YOU LOOK AT THE WORLD DIFFERENTLY? – PROCESSING OF FICTIVE MOTION SENTENCES IN POLISH-ENGLISH BILINGUALS

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42 On the embodied view, language comprehension involves perceptual-motor simulations of the content of utterances. Numerous behavioural, neuroimaging, and neurophysiological experiments show that understanding sentences expressing physical motion (actions) activates specific motor neural circuits that have a role in movement execution and perception (e.g. Buccino et al., 2005; Tettamanti et al., 2005). Remarkably, comparable findings have been reported for the processing of fictive motion (FM) sentences (cf. Talmy, 1996): figurative sentences where verbs that usually code real motion and actions are employed to describe a static scene in dynamic terms, e.g. A paved path runs along the edge of the car park (e.g. Cacciari et al., 2011; Saygin et al., 2010). These reveal that understanding a FM sentence modulates the activity of sensorimotor areas and involves dynamic conceptualizations (i.e. involving motion) of the described static scene.

Does describing a static scene in dynamic terms affect one's visual experience? Eyetracking studies on English (Matlock et al., 2004) and Hindi monolinguals (Mishra et al., 2010) showed that understanding FM sentences (e.g. The path runs through the valley) yields different eye movements for visual displays relative to their static counterparts (e.g. The path is in the valley). Listening to FM sentences prompts longer gaze duration and more fixations on the Figure (in the sense of Talmy, 1996; e.g. path, road, trail). It remains an open question, however, whether similar effects are present for the processing of FM sentences in one's L2.

The present contribution re-examines the above findings with new data recorded from Polish-English bilinguals. By

## LANGUAGE ACQUISITION AND PROCESSING

FRIDAY 26TH

14:20 – 14:40

ROOM B

modelling the eyetracking study on the paradigm employed by Matlock & Richardson (2004) and Mishra & Singh (2010), I attempt to answer the question whether bilinguals similarly conceptualize FM events in both of their languages, as reflected in eye movements across the display in a verbalized context. I will discuss the results from the eye-tracking study from an embodied cognition view.

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# COMPARISON OF EYE-MOVEMENTS DURING TEXT AND MUSIC READING

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44

The present study investigated similarities between reading of text and music notes. Eye-movements of children from primary music school (N = 39) were tracked during two reading tasks. In the sentence reading task we controlled for the frequency of words, whereas in the notes reading task we manipulated the meter of displayed notes. Additionally, in the second task children were asked to clap the rhythm of music. The study is in progress, at the stage of data analysis. Based on previous eye-hand span studies, we expect that during reading and clapping notes, novice children will have significantly more regressions and longer fixations than expert children, the differences will be most pronounced for notes with a faster meter. Analogously, it is expected that low frequency words will induce more fixations and regressions than high frequency words. Showing similarities between alphabetical text and music notes may help to improve methods of teaching both, reading music notes and alphabetical text.

## LANGUAGE ACQUISITION AND PROCESSING

FRIDAY 26TH

**14:40 – 15:00**

ROOM B

45

# INTEGRATING AUDITORY AND VISUAL LANGUAGE: AN EYE TRACKING STUDY ON MULTIMODAL LANGUAGE PROCESSING

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46 Human communication is multimodal by nature. We rarely rely on a single modality when using language in various communication settings from classrooms to face-to-face conversations. Interaction of spoken language with visual cues such as lip movements or gestures has been well established. There is also abundant literature exploring spoken language-driven eye movements on objects within visual world paradigm. Yet few empirical studies have systemically examined the simultaneous processing of contextual auditory and visual language with eye tracking methodology. This study focuses on how contextual written language is processed in the presence of concurrent speech. We intend to analyse eye movements of the participants while they are attending to a presentation along with a lecture under two different difficulty conditions manipulated by speech rate as average and fast. We will investigate the effect of (1) speech rate and (2) matching segments between speech and text and also (3) lexical effects (word length and frequency) on multimodal language processing as manifested by commonly reported eye movement measures (first fixation duration, single fixation duration, average fixation duration, gaze proportions and total viewing duration). This study is an attempt to establish a nexus by bridging research in the fields of reading, audio-visual speech and visual world. We expect to shed light on the nature of multimodal language processing with relatively natural language stimuli. We also expect to make inferences about allocating attention on either auditory or visual stimulus and about cognitive demands based on gaze data. Understanding how we integrate and/or segregate auditory and visual language for comprehension may lead to further eye tracking research on more complex multimodal language tasks such as simultaneous interpreting or audio-visual translation.

## LANGUAGE ACQUISITION AND PROCESSING

FRIDAY 26TH

15:00 – 15:20

ROOM B

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# AGE-RELATED DIFFERENCES IN READING SUBTITLES: AN EYETRACKING STUDY

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48 Age is known to be an important factor contributing to reading patterns (see Rayner 1998). Owing to “a progressive decline in visual sensitivity” (Jordan et al. in press), older readers sometimes experience significant difficulty in reading printed text and their reading patterns differ from those of young readers. Older readers tend to read more slowly than young readers: they make more regressions and the duration of their fixations is longer (Rayner et al. 2012: 394). It has also been found that “saccade latency increases with age” (Rayner 1998: 375). Interestingly, the differences in their eye movements do not negatively affect comprehension (Rayner et al. 2012: 395).

In this paper we report on the results of an eyetracking study among deaf, hard of hearing and hearing adults when watching subtitled videos. We have examined age-related and hearing-impairment-related differences in subtitle reading patterns. A preliminary analysis has showed systematic differences in eye movement patterns between different groups of participants. This suggests that reading subtitles – a dynamic text presented on screen simultaneously with the image and sound – may bear important similarities to the process of reading printed text in terms of age-related and hearing loss-related differences between readers.

**AUDIOVISUAL  
TRANSLATION**  
SATURDAY 27TH  
**09:00 – 09:20**  
ROOM A

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# DIFFERENT AUDIENCES, DIFFERENT BEHAVIORS: ON THE RECEPTION OF SUBTITLES BY USERS WITH DIFFERENT LEVELS OF L2

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50 Although the *abstract viewer* has been considered central to studies of audiovisual translation (Kovačič 1995), the need for more reception studies that help define the profile of actual users is still latent. In a world where it is difficult to argue that English is an entirely foreign language anymore (Pym 2011) due to a high level of voluntary and involuntary exposure, it is important to know the way how users engage with subtitles translated from English in the presence of the English-language soundtrack. As part of a study on reception of non-professional subtitling, fifty-two young participants ( $M = 21.19$ ,  $SD = 3.27$ ) with different listening comprehension skills in the source language (English) were tested under the same conditions. The study included participants with high level of English and participants with low level of English. All of them were shown three excerpts from *The Big Bang Theory* with professional and non-professional subtitles. Eye-tracking was used to collect gaze-behavior data and questionnaires and interviews were used to elicit information on the viewers' understanding and enjoyment of the audiovisual material. As expected, findings reflect a significant difference in gaze data behavior depending on the level of English: while the participants with a low level of English relied mostly on the subtitles to access the linguistic code (about 50% of the fixation time was spent in the subtitle area), the participants with a high level of English were able to make a more conscious decision about whether to read the subtitles or not (they generally directed their gaze to the subtitle area to confirm or contrast information). Nevertheless, findings of the comprehension questionnaire do not reflect this same difference: participants' comprehension is similar regardless of their level of proficiency in English and their level of satisfaction with the translation and the content does not vary.

**AUDIOVISUAL**

**TRANSLATION**

SATURDAY 27TH

**09:20 – 09:40**

ROOM A

Kovačič, Irena (1995): "Reception of subtitles. The non-existent ideal viewer." In: *Translatio (FIT Newsletter)* 14(3-4), 376-383.

Pym, Anthony (2013): "Inculturation as elephant. On the spread of literary modernity." In: Nelson, Brian / Maher, Brigid [eds.]: *Perspectives on Literature and Translation: Creation, Circulation, Reception*. London / New York: Routledge, 87-104.

# CRAZY JAPANESE SUBTITLES? – SHEDDING LIGHT ON THE IMPACT OF IMPACT CAPTIONS

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52 In many Asian countries such as Japan, the use of intra-lingual open captions on TV is prevalent and well established. This novel use of what is commonly called “Telop” in Japan, also referred to as impact captions elsewhere, has recently begun to spread into Western counterparts, with a notable example being the BBC’s Sherlock. To our knowledge there are currently no guidelines for best practice, allowing broadcasters to continue to use impact captions in an ad hoc manner. In an attempt to shed light onto the relationship between the producer’s intention and the viewers’ response as well as reaction we conducted a series of empirical studies, using a multimodal content analysis and a reception study within the cognitively grounded framework of relevance theory.

This paper presents part of our findings from two linked studies that examined 1) if / how captions ‘hook’ viewers’ attention, and 2) if captions ‘retain’ the viewers’ attention. Using data derived from a mixed-methods approach including eye tracking that evaluated the relationship between cognitive processing and communicative stimuli, together with a behaviour observation study that evaluated viewer reactions, and a multimodal content analysis, we demonstrate how impact captions facilitate producers to hijack viewers’ visual attention and subsequently their interpretation processes by highlighting certain parts of a programme to lead the viewers to the intended interpretation.

Our studies make a methodological contribution with a mixed-methods approach which addresses problems relating to the highly subjective nature of media consumption and the inter-subject variance of behavioural measures.

## **AUDIOVISUAL TRANSLATION**

SATURDAY 27TH

**09:40 – 10:00**

ROOM A

Also, our findings can arguably have significant practical applications for effective caption uses in a range of scenarios, especially those in increasingly eyes-busy environments, and for special needs populations, such as the elderly with visual and cognitive impairments.

# COMPARISON BETWEEN PEOPLE FROM A DUBBING VS. A SUBTITLING COUNTRY IN THE COMPREHENSION OF A TELEVISION DOCUMENTARY

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54 In this experiment we showed a short documentary to two groups of test subjects: native Finnish speakers, who had little or no knowledge of Russian, and native Russian speakers, who were learners of Finnish. The documentary was narrated in Russian and subtitled in Finnish. Thus, in terms of communication channels, the Finnish natives had to rely solely on the subtitles to follow the narration, while the Russian natives could understand (at least partly) both the narration and the subtitles. The subjects' comprehension of the documentary was assessed with a questionnaire, which included 28 open questions about details that could be found in only the narration (9 questions), the subtitles in addition to the narration (13 questions) or only in the image (6 questions). A part of each group had also their eye movements recorded, so that we could analyse the scan paths of the subjects.

Preliminary results of the questionnaires show that Finnish native speakers answered significantly better to questions concerning information that was available in the image. Russian native speakers, in turn, answered better to questions concerning the information available in the subtitles. This suggests that having access to more than one information channel enhances the acquisition of information and comprehension of the audio-visual material. Then again, subtitles seemed to distract Russian native speakers more than Finnish native speakers, possibly because subtitles are a more familiar element to the Finnish and they are used to reading them. The eye tracking data is expected to support these conclusions and give further insight into the ways, in which the cultural background (dubbing vs. subtitling) affects the viewing behaviour of the test subjects.

**AUDIOVISUAL  
TRANSLATION**  
SATURDAY 27TH  
**10:00 – 10:20**  
ROOM A

# RECEPTION, INFORMATION FLOW AND AESTHETICS: INTEGRATED TITLES AND OTHER POSSIBLE IMPROVEMENTS

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The presented research is based on my master's thesis on "Integrated Titles as an Alternative Solution to Traditional Subtitles" (09/2012, FTSK Germersheim, University of Mainz, Germany). Traditional subtitles are normally added automatically into the film, disturbing the composition as well as potentially drawing the viewers' attention – depending on his or her language skills and the source language of the film – away from the plot. Poorly placed subtitles can disturb – or even destroy – the entire artistic concept of a film. The focus of my doctoral thesis is on a possible modern alternative to traditional subtitles: integrated titles.

While the dynamic integration of displays and captions can already be seen in film material such as the British series "Sherlock", there are very few examples of integrated titles. One example is the American series "Heroes", in which the Japanese conversations of two of the main characters are translated with integrated titles. Another example involves the Spanish and a few English sentences in the film "Man on Fire" that are communicated interlingually with several different kinds of integrated titles. Apart from these two, there are almost no other professional examples of integrated titles.

By means of the first episode of the British series "Being Human" (so far without official German subtitles or dubbing), I showed how integrated titles can increase understanding and preserve the composition and aesthetics of the film.

In a three-step-experiment during my master's thesis, the advantages and disadvantages of integrated titles were analysed by recording the eye movements of more than 45 participants. The results show that the reduction of the

necessary saccades (eye movements) gives viewers more time to focus on the image and makes it easier for them to link the titles to the plot. Moreover, the film material was perceived as more aesthetic and closer to the original version. In the long term, these results can lead to a rethinking of the subtitling and handling of film material.

My recent work includes a second eye-tracking study of integrated titles created for the short documentary "Joining the Dots" by Pablo Romero-Fresco, aiming to provide modularly designed guidelines for integrated titles and an approach on how to maintain the typographic identity of a film.

Further results and research concerning translated text in films, their interpretation, preservation of film identity and the integration of graphic design and typography theory will be presented at the conference.

**AUDIOVISUAL  
TRANSLATION**  
SATURDAY 27TH  
**10:20 – 10:40**  
ROOM A

# MAPPING GAZE ONTO REPRESENTATIONS OF TEXT RHETORICAL STRUCTURE

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This paper examines interim and final renditions in translation task execution with a view to exploring translator's understanding processes during instances of effortful text production (Alves et al, 2010; Alves, Pagano & Da Silva, 2011; in press). More specifically, it presents an analysis of eye tracking data enhanced by fine-grained linguistic analysis of both translation process and product. An experiment was carried out to log the performance of 8 Brazilian and 8 German professional translators who translated one of two versions of a popular science text from English (L2) into German and Brazilian Portuguese (L1). First, interim, and final target text renditions, along with translation microunits (Alves & Vale, 2009), pauses and production time, were analyzed for between-subject and within-subject variability (Alves, Pagano & da Silva 2010). Next, subjects who stood out as outliers were selected for case study and had their results cross-analyzed with their recursiveness, look backs and forward fixations for producing target text. The target texts produced by them were analyzed in terms of their rhetorical structure (Mann & Thompson, 1988). The analysis pointed to one of the subjects as standing out from the others due to the number of substantial differences found between the rhetorical structure of the source text and that of the target text produced upon task completion (Da Silva, 2012). The subject's gaze path was then examined and mapped onto the subsequent rhetorical representations of his target text

**DIVERSITY**

SATURDAY 27TH

09:00 – 09:20

ROOM B

as the subject progressed towards a final representation. Correlations were pursued between the fixation points making up the gaze path and the satellite and nuclei identified in the rhetorical structure of the target text renditions subsequently produced by the subject. Gaze path data was found to provide insights into how the subject dealt with translation problems that involved effortful text production and what parts of the rhetorical structure actually prompted the problems encountered by the subject.

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# A COMPARISON OF THE PROCESS AND THE PRODUCT OF TRANSLATION SELF-REVISION AND OTHER-REVISION

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60 According to Translation Service Requirements: the European Standard EN 15038, the translation text should be revised by a person (normally a professional/senior translator) other than the original translator himself. This literally indicates that other-revision excels self-revision in terms of quality assurance. In recent years, self-revision and other-revision have been researched from different perspectives, for instance, revision phase (Jakobsen in Alves 2003); revision mode (Brunette et al. 2005); revision degree (Mossop 2007); revision effectiveness (Künzli 2007) and revision procedure (Robert 2008; 2013). However, few studies have empirically proved that other-revision outdoes self-revision in quality and analysed the cognitive processes to find out the rationale(s). This study attempts to achieve these.

10 student translators (mother tongue - Chinese, second language - English) are invited to translate, self-revise a 100-word introductory text, and other-revise a similar text from English into Chinese without time constraints in two days. Eye-tracking, key-logging and cue-based retrospection are used as data collection methods. User activity data (Carl and Jakobsen 2009; 2010) are quantitatively analyzed to present, compare and analyze the cognitive processes. A case study is conducted to compare the quality of six final translation texts after the operation of self-revision and other-revision.

The findings will touch upon both the process and product of the two types of revision, comparing the effectiveness, as well as quality, and analyzing the rationale(s) from a cognitive process approach.

**DIVERSITY**

SATURDAY 27TH

**09:20 – 09:40**

ROOM B

- Brunette, L. / Gagnon, C. / Hine, J. (2005): "The GREVIS Project: Revise or Court Calamity." In: *Across Languages and Cultures*, 6 (1), 2945.
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# LOST IN SIGN LANGUAGE INTERPRETATION – AN EYETRACKING STUDY ON THE VISUAL ATTENTION OF HEARING-IMPAIRED RECIPIENTS

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62 With respect to the reception of television as an audio-visual medium, deaf people can only access the visual channel. To cover their right of barrier-free access to information, most broadcasting stations provide subtitling for deaf and hearing-impaired people. For a considerable part of the deaf community, however, the written and spoken German language is a foreign language, because German sign language is their native tongue. Therefore, sign language interpretation would be a more sufficient solution for the envisaged target group (cf. Grbić 1998; Bavelier et al. 2006). However, if it comes to sign language, the range of German TV programmes is not very broad. However, there is a station called PHOENIX that broadcasts the regular German news programme “Tagesschau” with a sign language interpreter displayed at the right-hand side of the screen (cf. Prillwitz 2001; Kocher 1999).

Since the news is a very compact and concise format, designed to present a high density of information in a short time supported by audio-visual supplementary such as diagrams, graphs, pictures, short movies, and interviews, this paper deals with the question on how the target group copes with a setup that is originally designed for hearing people (cf. Pannasch 1999).

How is their gaze behaviour with respect to spatial-visual attention during perception, do they develop certain patterns or strategies to register the above mentioned additional information items and if yes, can specific triggers for these shifts of attention be identified? (cf. Yantis & Jonides 1990)

First results from this eyetracking pilot study conducted with six participants with different degrees of hearing impairment at the FTSK Germersheim indicate that this

**DIVERSITY**

SATURDAY 27TH

**09:40 – 10:00**

ROOM B

news design seems to produce an information overload. Furthermore, certain strategies can be identified to cope with this overload and finally, the positioning of the sign language interpreter at the periphery of the screen is insufficient. On this basis, recommendations for a more convenient news design for this special target group can be formulated.

- Bavelier, Daphne / Dye, Matthew W.G. / Hauser, Peter C. (2006): “Do deaf individuals see better?” In: *TRENDS in Cognitive Science* 10 (11). Amsterdam: Elsevier, 512-518.
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# THROUGH OTHERS' EYES

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This paper presents experimental data which supports the hypothesis that translation training trains metacognition (ToM). As an other-directed act (Robinson 2001: 8), translation involves a greater degree of metarepresentation than standard communication. In order to re-create the author's text in the mind of the reader, the translator has to represent the mindsets of both, author and target public. The capacity to represent other minds is called metacognition or Theory of Mind (ToM) (Sperber 2000: 3).

We tested eight students at different levels of their translation training (BA/MA) in an experimental setting combining eye-tracking and key-logging (Hansen 1999, Göpferich 2008). They were presented with 40 sentences in a Translog (Jakobsen 2011) interface and asked to provide a written reformulation. Gaze and key stroke data were gathered during the reformulation process.

According to our predictions, MA students should have a higher metacognitive proficiency due to their higher level in translation training, and thus show signs of increased cognitive effort in the ToM condition, but not in the noToM condition. In the present setting, cognitive effort is measured in terms of response times, fixation count and fixation duration. Longer response times, numerous and long fixations are taken to be signs of higher cognitive effort.

As predicted, MA students yielded more and longer fixations in the ToM condition as compared to the noToM condition. They also spend more time on the production of a target sentence in the ToM condition. In contrast, BA students seem to struggle with the noToM condition. They spend more time on the noToM condition and also fixate it more often.

These findings suggest that BA students spend more time with microlinguistic analyses of the source text, whereas MA students engage in macrostrategic text processing.

## DIVERSITY

SATURDAY 27TH

10:00 – 10:20

ROOM B

The overall result indicates that translation lets translators see the world through other's eyes.

## RESEARCH AREAS

Translation studies, neuroimaging (fMRI), translation process research, pragmatics

- Bavelier, Daphne / Dye, Matthew W.G. / Hauser, Peter C. (2006): "Do deaf individuals see better?" In: *TRENDS in Cognitive Science* 10 (11). Amsterdam: Elsevier, 512-518.
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# INVESTIGATING COGNITIVE EFFORT IN POST-EDITING: A RELEVANCE-THEORETIC APPROACH

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This paper aims at investigating cognitive effort in post-editing from English (L2) into Brazilian Portuguese (L1) from a relevance-theoretic perspective (Wilson 2011). In order to do that, we compare post-editing processes in two different environments, namely interactive and non-interactive post-editing. Using short technical texts, we test the impact of interactive and non-interactive modes with respect to how much cognitive effort is needed in each one of these environments. The CASMACAT platform (Elming and Bonk 2012) was used to collect post-editing data in an interactive mode whereas the key-logging software Translog was used to collect post-editing data in a non-interactive mode. The relevance-theoretic concepts of conceptual, procedural and hybrid encodings (Blakemore 2002) and the methodology developed by Alves and Gonçalves (2013) to assess translation task execution

## POST-EDITING MACHINE TRANSLATION

SATURDAY 27TH

11:20 – 11:40

ROOM A

were used as framework for data analysis. 18 subjects, who had Brazilian Portuguese as their L1 and English as L2, performed interactive and non-interactive post-editing tasks in random order, their processes being recorded with a Tobii T60 eye tracker. Subsequently, eye-tracking data was analysed to evaluate the impact of interactive and non-interactive modes on post-editing processes and to assess how much cognitive effort was needed in each environment. Preliminary results, measured in terms of mean fixation counts and mean fixation duration, show that there is more allocation of cognitive effort in the interactive mode, assessed according to the subjects' handling of conceptual, procedural and hybrid encodings. On the other hand, however, cognitive effort in a non-interactive mode is not only faster but even more precise with respect to interventions made in conceptual, procedural and hybrid encodings. Contrary to what would be expected, interactive post-editing was slower and demanded more cognitive effort. The results have interesting implications for the development of interactive platforms for post-editing tasks.

## KEYWORDS

cognitive effort, post-editing processes, eye tracking, interactive machine translation, conceptual/procedural encodings

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# TRACKING POST-EDITING PERFORMANCE WITH CASMACAT 3.0

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target productivity gains derived from machine learning methods, while the e-pen functionality will be tested as an alternative input method for final proof-reading.

Relying on the key-logging and eye-tracking functionalities of the CASMACAT workbench, we will report on user performance while working with the latest features implemented in the workbench. Findings on how professional post-editors perceived these new functionalities will also be reported based on questionnaires and interviews.

68

Insights from empirical translation activity can provide us with a better understanding of human translation processes to inform the development of advanced translation tools. Our presentation will report on the latest findings resulting from the third field trial of the CASMACAT project. This project seeks to advance computer-assisted translation by integrating new types of interaction between the human translator and the computer for the post-editing of machine translation outputs.

In June 2014 we will conduct a new series of experiments with professional post-editors in order to test the latest features implemented in the CASMACAT workbench. Three different features will be involved in the design of these experiments: i) Interactive Translation Prediction (ITP) during the post-editing process, ii) active and online adaptation strategies based in post-editors' performance, iii) e-pen integration for final text revision. ITP should be understood as a sub-field of computer-aided translation where the computer predicts the text that the user is typing by taking into account all the contextual information that is available. This ITP feature will be tested under two different visualisation conditions depending on how the system interactively suggests autocompletions while the human translator is typing. The adaptation strategies will

## POST-EDITING

### MACHINE TRANSLATION

SATURDAY 27TH

**11:40 – 12:00**

ROOM A

69

# HUMAN TRANSLATION VS. (POST-)EDITING: A LOOK AT CONSCIOUS PROBLEM-SOLVING STRATEGIES (INTERNET RESEARCH)

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Technical development and globalization continue to raise the need for translations. To improve efficiency and cost-effectiveness, organizations increasingly make use of machine translation (MT) and edit the MT output to create a fluent text that adheres to the given text conventions (cf. O'Brien 2011, Elsen 2012). This procedure is known as post-editing.

In a series of experiments, 24 translators (professional and semi-professional) produced translations from scratch, post-edited and monolingually edited MT output. These translation sessions were recorded with an eye-tracker (Tobii TX 300) and a keylogging program (TRANSLOG II). Further, the participants were asked to fill out questionnaires before and after the experiments. This data triangulation allows an inside into the translation processes and the translator's mind.

No matter if translating from scratch or pre-translating the text with MT, the source text contains the same problematic passages. Some of these problems should already be solved when using MT. However, new problems may arise as well. Accordingly, the problem-solving strategies of the translators should differ for the tasks.

This talk will focus on the internet research of the participants, a conscious problem-solving strategy. First findings show that the translators look up much more words/phrases when translating from scratch than (post-)editing. However, in the instances when the internet is used as a problem-solving tool, research tends to be more extensive in (post-)editing. Is the MT output a help or a burden on this lexical level? Do different problem-solving patterns arise in the different tasks? And are there differences between professional translators and semi-professional translators?

**POST-EDITING**  
**MACHINE TRANSLATION**  
SATURDAY 27TH  
**12:00 – 12:20**  
ROOM A

70

71

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# INVESTIGATING THE IMPACT OF NOMINALISATIONS ON THE READING PROCESS: A CASE STUDY USING THE FREIBURG LEGALESE READING CORPUS

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72

Research using reading corpora gains increasing influence in psycholinguistics and related disciplines. Reading corpora are large collections of eyetracking data on text material (Kliegl et al., 2006; Kennedy et al. 2003; Boston et al., 2008). They can be described as classical linguistic corpora with an additional annotation layer consisting of eye-movement data of human readers. When this information is combined with annotation data on a linguistic level, we can tackle questions related to the human processing of natural language data on several levels.

The Freiburg Legalese Reading Corpus (FLRC, Wolfer et al., 2012) consists of roughly 16000 tokens from German jurisdictional texts and reading data of 80 participants. It is divided into a (smaller) part consisting of reformulations of text excerpts and a (larger) part of three complete decisions and press releases by the German jurisdictional court (Bundesverfassungsgericht) as well as newspaper articles summarizing the decisions. The reading corpus is enriched with lexical, syntactic and textual information. Lexical information comprises word frequency, word familiarity, part-of-speech as well as bi- and trigram information extracted from the lexical database dlexDB (Heister et al., 2011). Syntax is annotated with phrase structure. On the textual level, several referential properties are included

## READING

SATURDAY 27TH

11:20 – 11:40

ROOM B

(forward or backward reference, reference distance, additional information by the referential expression, specificity of the referential expression).

We will introduce the design principles of the reading corpus and elaborate on the possibilities it provides for psycholinguistic research. In a case study, we will present results regarding the use of nominalisations and the consequences for the reading process. Nominalisations are a well-known feature of German jurisdictional (but also scientific) texts (Hansen-Schirra & Neumann, 2004). As suggested by our data, they seem to delay the reading process considerably, even in the student population we assessed. Reformulations seemed to resolve some of these issues.

## RESEARCH TOPICS

reading studies, comprehensibility studies, reformulations

73

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# HOW DO POLISH DYSLEXIC CHILDREN READ? EYE-TRACKING STUDY OF READING STYLES AMONG 10-15 YEARS OLD CHILDREN WITH AND WITHOUT DYSLEXIA

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74

What can eye-movements tell us about comprehension and comprehensibility of texts? A lot of research has been done on reading, using both experiments with isolated sentences and, in recent years, eyetracking corpora. The latter, however, are mainly designed to investigate either low-level processes of the reading process (Potsdam Sentence Corpus, Kliegl et al., Grabner, Rolfs, & Engbert, 2004) or focus on the relation between sentence properties and eye-movements (e.g., Dundee-Corpus, Kennedy, A., Hill, R. L. & Pynte, 2003). A variety of measures, such as first fixation durations, first pass-, regression path and total reading time, have been proposed to reflect different aspects of the comprehension process. However, relatively little is known about how different eye-movement variables are related to comprehension on the discourse level. In this presentation we investigate the influence of discourse-level variables on reading behaviour and knowledge transfer.

We present a reading corpus of 16 German popular science texts. Each text was read by 15 of 60 participants. The texts are annotated on all linguistic levels, ranging from word composition to discourse structure. Knowledge of the readers concerning the covered topics was measured before and after reading the text, and a control

**READING**

SATURDAY 27TH

**11:40 – 12:00**

ROOM B

group not reading the texts was included for comparison. Eye-movements were measured using an SR Research EyeLink 1000 eye-tracker.

We analysed the relation between different measures of reading-time and the main discourse strategies (descriptive, explanatory and historical) used in the texts. Results show that discourse strategy influences some, but not all reading-time measures: explanatory text sections were not read slower on first pass, but induce more regressions and lead to higher total reading times. However, performance on questions referring to explanatory sections did not differ from the other two, indicating that discourse strategies induce different reading strategies to extract the relevant information in a text.

75

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# INFLUENCE OF DISCOURSE FUNCTIONS ON READING COMPREHENSION: EVIDENCE FROM A GERMAN READING CORPUS OF POPULAR SCIENCE TEXTS

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Reading is a unique human ability, necessary for its evolution and living in modern society. For about 10% of children, reading is a huge challenge (Peterson and Pennington, 2012). These children are affected by neurodevelopmental disorder called dyslexia. It is characterized by slow, inaccurate word recognition and spelling difficulties (McCandliss, 2012). Neurocognitive causes of dyslexia are still not clear.

Researchers supposed, that dyslexia is a language disorder with deficits caused by the phonological processing problems. Now they believe that a single phonological deficit is not sufficient to cause dyslexia (Peterson and Pennington, 2012). There is a huge probability that the non-phonological subtype of dyslexia also exists (Bosse et al., 2007). It would explain the mysterious inconsistencies in many research results. Scientists still search for another explanations of dyslexia. They recently presented the theory of visual attention deficit (Ramus et al., 2003) and the possibility of oculomotor deficits (Bucci et al., 2008).

**READING**

SATURDAY 27TH

**12:00 – 12:20**

ROOM B

Results obtained using eye-tracking research, show that eye movements of dyslexic persons differ from controls. They are characterized by a greater number and duration of fixations, shorter saccades and more regressions (Rayner, 1998). In addition, a poor binocular saccade coordination and fixation is observed (Bucci et al., 2008, Jainta and Kapoula, 2011).

The aim of the study was to compare the way of reading between dyslexic and control Polish children. Children in the age between 10 and 15 years read sentences with specially selected target words (low vs high frequency) and a simple short story. The study is in progress and data will be analyzed in terms of differences in the reading speed, saccades length, number of fixations, regressions and text understanding level. Results of this study will be used to create a special reading training for dyslexic children.

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# READING POPULAR SCIENCE: THE INFLUENCE OF TEXT-IMAGE COHERENCE ON READING BEHAVIOUR

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78

In popular-scientific articles a range of different design elements comprising pictures, diagrams, graphics as well as the typeface of titles, text inserts, information boxes, etc. are used to arouse the readers' interest and present scientific information in a visually appealing and easy-to-read way (cf. Klemm 2011). These elements are usually all somehow related, so that text-picture coherence is created: photographs can serve as eye-catcher, relating to the title of the text. Captions are used to describe diagrams, graphics, etc., which in turn visualise, for example, an experiment described in the main text (cf. Stöckl 2004). The question arises whether readers of such articles are "guided" by this coherence, i.e.:

- Is the coherence between specific elements reflected in reading behaviour, so that, for example, a picture and its caption are looked at successively?
- When text-image coherence is disrupted, does this irritate the reader?

In order to investigate these questions, we carried out two pilot studies using eyetracking technology (Duchowski 2007): one concentrated on length and succession of eye fixations for different design elements (title, photograph, diagram) in a popular-scientific text. The second study analysed reading behaviour for a popular-scientific text,

which was read by three subject groups, but contained a different picture per group (either coherent or incoherent with the text's content). A third study focusing on the relationship between pictures and captions is in preparation. By triangulating the data gained from the different studies we will be able to draw conclusions on the text-image coherence in popular-scientific texts on the one hand and on the role of visual elements as means of popularizing scientific contents on the other.

**READING**

SATURDAY 27TH

**12:20 – 12:40**

ROOM B

79

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SensoMotoric Instruments



NEURO DEVICE