

Edited by

Susanne Göpferich  
Arnt Lykke Jakobsen  
Inger M. Mees

# Looking at Eyes

Eye-Tracking Studies of Reading  
and Translation Processing

36

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COPENHAGEN STUDIES IN LANGUAGE

Looking at Eyes



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Eye-Tracking Studies of Reading and Translation Processing

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## INTRODUCTION: LOOKING AT THE EYES OF TRANSLATORS

The idea for this (and indeed also the next) issue of *Copenhagen Studies in Language* was conceived in Copenhagen while Susanne Göpferich (University of Graz) spent a sabbatical at CBS in order to complete her book (Göpferich 2008) on translation process research.

At the Copenhagen Business School (CBS), translation process studies have been conducted for well over a decade. Originally, most of the work was inspired by the development of Translog, a program which performs keystroke logging and registers pauses in the translation process (Jakobsen & Schou 1999). Combined with the well-established think-aloud procedures (first introduced by Ericsson and Simon in 1980 and 1984 and later applied to translation by Krings 1986 and many others), this tool provided new insights into what goes on in the translator's mind. More recently, eye-tracking technology has entered the scene of translation process research. Since it can be used to register a person's eye movements on a computer screen throughout various processes, new avenues have again been opened up for studying translator behaviour, and research has taken another leap forward. The ten contributions to the present volume are all the result of this new interest in looking at eyes.

With the establishment of the Centre for Research and Innovation in Translation and Translation Technology (CRITT), and consequently a dynamic research environment with visiting international scholars, a number of members have been fortunate in obtaining funding for a variety of projects. As is also implied by the name of the centre, research in translation and translation technology has captured a prominent position in the modern world, and this is perhaps one of the reasons that we have been successful in obtaining funding both from the EU FP6 programme for the *Eye-to-IT* project,<sup>1</sup> and from FKK, the Danish Research Council for Culture and Communication, for a project entitled *Comprehension and production processes in translation and interpreting hybrids*.<sup>2</sup>

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<sup>1</sup> See <http://cogs.nbu.bg/eye-to-it/> for a description of the project.

<sup>2</sup> Support from the EU FP6 IST programme and FKK for six of the contributions to the present volume is gratefully acknowledged.

One major aim of the Eye-to-IT project is to explore the possibility of combining eye-tracking and key-logging in order to create new research opportunities for studying translation processing, particularly with respect to how source-text comprehension and target-text production are coordinated. An additional applied goal is to determine the feasibility of developing a translation tool based on online interpretation of a user's gaze behaviour across a computer screen. For this to work, the application must be able to very quickly detect the optimal situations in which human translators can benefit from automated assistance. And this again means that it is essential to arrive at an understanding and modelling of typical reading and translation behaviour. Four of the articles in the present volume address these research challenges while two of the contributions discuss some of the more technical challenges posed by the new methodology.

One of the chief advantages of having obtained *the Eye-to-IT* research grant is that we now have an eye-tracker (Tobii 1750)<sup>3</sup> at our disposal. Our collaboration with colleagues from other countries has resulted in one other great advance. Earlier we were restricted to manual identification of the lexical item or items related to a particular gaze fixation on the screen. In the Eye-to-IT project, a new module, the Gaze-to-Word Mapping (GWM) tool, has been developed permitting automatic identification of words on the basis of gaze fixations.<sup>4</sup>

Eye movements in reading have been studied for several decades, but the overwhelming majority of research has been on the processing of short strings of words. It has been established that fixation duration is affected by variables such as word familiarity, word predictability, word length and complexity, and lexical and/or syntactic ambiguity. What we still lack information about in order to be able to build practically useful applications based on this technology is eye-movement behaviour during continuous reading or reading with different purposes in mind, e.g. reading in order to translate.

The aim of this collection, *Looking at Eyes: Eye-Tracking Studies of Reading and Translation Processing*, has been to assemble a number of studies that use different methodologies (often in combination) to increase

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<sup>3</sup> See <http://www.tobii.se>

<sup>4</sup> For a description of the GWM tool, see <http://www.cs.uta.fi/~oleg/gwm.html>

our understanding and modelling of the way translators read, and especially to delve into the issue of how the human brain is capable of controlling and coordinating such a complex interlingual process as translation. Ideally, our results will both benefit translation pedagogy and enable us to develop intelligent support applications for translators.

The ten contributions fall into three categories. The first studies look at eye movements in connection with translation and/or reading activities. The second batch focuses on viewing subtitles/pop-up gloss or food labels. The final three are devoted to strictly methodological and technical issues, one testing the reliability of the eye-tracker, one pointing out the advantages of certain statistical techniques over others when engaged in process research and one suggesting a new probabilistic framework of fixation modelling.

In our first contribution Barbara Dragsted and Inge Gorm Hansen employ a combination of eye-tracking and keystroke logging technologies to collect experimental data. By analysing a selection of translation segments, they wish to explore how translators coordinate comprehension and production processes. In addition, they investigate the validity of the current practice of identifying translation segments purely on the basis of the occurrence of production pauses. Results obtained for the eye–key span and fixation duration from a small sample of eight translators indicated that difficult words were fixated longer and attracted attention long before they were translated. They also found that coordination between source text and target text was not often contained within the boundaries of a (pause-defined) segment.

In the next contribution, Selina Sharmin, Oleg Špakov, Kari-Jouko Räihä, and Arnt Lykke Jakobsen analyse the eye movements of eighteen translation students who translated three different texts, one easy and two difficult, under three different time conditions. In their experiment, time pressure was found to affect the average duration of fixations on the source text, so that when less time was available, fixations were shorter. The effect of text complexity was different, however. Here, fixations were more frequent if the text was complex, but not longer. Touch typists were (obviously) able to look longer at the screen than non-touch typists, who frequently looked at the keyboard, and touch typists were also able to make

faster gaze transitions between the source and target texts, and yet they completed fewer tasks within the set time limit.

In the third paper, Annette Sjørup describes a pilot study of the eye-movement behaviour of three subjects with the aim of developing a research design for identifying professional translators' processing of linguistic metaphors. Eye-tracking technology is employed to discover if different patterns of eye movement (gaze times) emerge when the subjects encounter metaphorical expressions as compared with literal expressions. As naturally occurring text often provides more contextual information than manipulated texts, and therefore better reflects the cognitive effort involved, it was considered important to test whether a design using such text was indeed practicable. It was found that the texts may require somewhat more manipulation to make them comparable. The first tentative results indicated relatively longer fixation times for metaphorical expressions.

Sharon O'Brien's study is inspired by an interest in how translators interact with Translation Memory tools. Obviously, exact matches are easy to process, but how do translators deal with fuzzy match values? In an experiment using eye-tracking methodology, O'Brien investigated the processing effort required for fuzzy matches ranging from 50 % to 99 % similarity. In addition, a qualitative survey was employed. The results indicated that the relationship between cognitive load and fuzzy match value was not a straightforward linear one. The data also showed that translators do not make extensive use of the fuzzy match value presented by the TM system; rather they look at and compare text as a way of establishing differences between old and new segments.

The last of the studies involving translation is that by Arnt Lykke Jakobsen and Kristian T.H. Jensen, who conducted an experimental study aimed at investigating effects on eye movements when four almost identical texts were read with four different purposes in mind. Six professionals and six translation students performed four different tasks: reading (a) for comprehension; (b) with the intention of translating the text afterwards; (c) combined with oral translation; (d) combined with written translation. The last of these modalities served the additional purpose of finding out how translators' visual attention was distributed between the source and target texts. Task times, fixation counts, gaze times and duration