# THE INFLUENCE OF FORESHADOWING METAPHORS IN A CRIME STORY BY IAN FLEMING

Titus von der Malsburg (UC San Diego), Holly Joseph (Brookes University), Emily Troscianko (University of Oxford), Karin Kukkonen (University of Turku) & Kate Nation (University of Oxford)
malsburg@ucsd.edu

Measures of reading time have taught us a lot about the cognitive processes underpinning language comprehension. Can methods from reading research also be used to study the effects of literary devices such as metaphor in authentic literary texts? To answer this question we adapted standard methods established in psycholinguistic research to work with literary texts.
**Design:** We conducted two experiments to establish a first proof of concept. These experiments investigated the impact of metaphors on the reading process in the opening paragraphs of Ian Fleming's story "From a View to a Kill." At the beginning of the story, metaphors of violence and death vaguely foreshadow a murder that takes place later on in the excerpt. Participants read either the original text or a version in which these metaphors were neutralized, for instance, *"the hurtling face under the crash helmet"* was replaced by *"the racing face under the smooth helmet,"* or *"his tombstone teeth"* by *"his yellow teeth."* Forty target regions were defined in subsequent paragraphs to examine the effect of foreshadowing metaphors on reading behavior.
Experiment 1 used eye tracking (EyeLink 1000 eye tracker, N=40) while Experiment 2 was administered online using the self-paced reading method (Amazon Mechanical Turk, N=200). The purpose of the second experiment was to evaluate a method that yields more data at lower cost. In the first experiment, the text was presented on several pages (4–8 sentences per page) and participants could not revisit previous pages. In the second experiment, the text was presented using centered self-paced reading.
**Analysis and predictions:** In standard experiments, the target regions are carefully crafted to elicit similar effects. Since this was not possible in the present study, we needed a more powerful statistical analysis approach that allowed us to answer several questions: 1) Was there an overall effect of the manipulation on how the target regions were read? 2) Did the target regions differ in how they were affected by the manipulation? 3) How exactly were the individual target regions affected by the manipulation? We answered these questions using Bayesian linear mixed models implemented in the probabilistic programming language Stan. These models contained a fixed effect for the condition (foreshadowing metaphors: yes or no), a covariate for region length (in characters, centered), and random intercepts and slopes where appropriate. Foreshadowing metaphors were predicted to make it easier for readers to ascertain the character and purpose of the man who turns out to be 'the killer' in the regions leading up to the murder and to make the murder scene less surprising and therefore easier to process.
**Results:** In Experiment 1 (eye tracking), foreshadowing metaphors did not influence the average reading times in the target regions. However, there was significant variation in how foreshadowing metaphors affected the individual regions (total reading times, $p < .05$). Regions that were read slowly on average (after accounting for length) were read even slower when metaphors foreshadowed the murder and fast regions were read faster ($p < .1$). In Experiment 2 (self-paced reading), we found a highly reliable main effect with shorter reading times in the condition with foreshadowing metaphors (839 vs. 963 ms, $p < .001$).
**Conclusions:** These results show that foreshadowing metaphors have a measurable impact on reading behavior even several paragraphs downstream from where they appeared. This finding validates our research approach and suggest that the empirical study of reading in literary texts is feasible and informative. The results of the self-paced reading experiment are consistent with our prediction that processing should be harder in the absence of foreshadowing metaphors. However, the effects observed in eye tracking were qualitatively different, which may reflect differences of the two reading modalities (self-paced reading is more constraining) but also differences in the tested subject populations (students vs. workers on MTurk). Investigating the cause of these differences will be an interesting topic for future research.