Why do people change their language?

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When people gradually stop speaking one language and adopt another, this process is called language shift or language spread: the space where the "old" language is used becomes smaller and smaller over time as it is replaced by the "new" language (see Figure 1). The spread of the new language may be regarded as a diffusion process, where the movement of languages may be compared to the movement of atoms [1]. Ultimately, language shift may even lead to the "death" of a language when no-one uses it anymore at all.

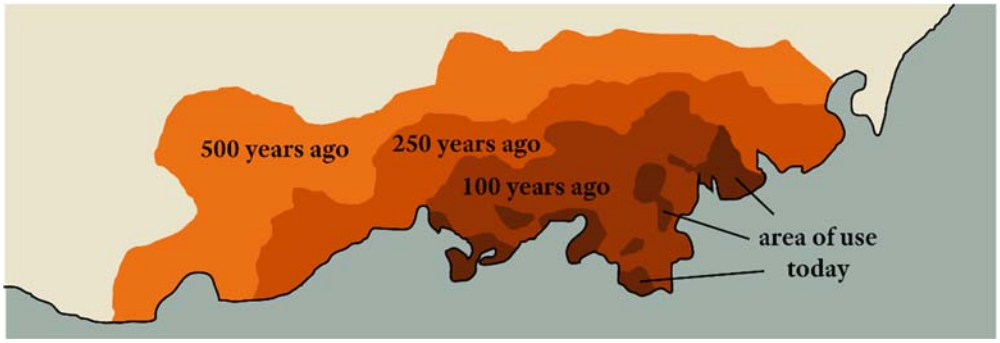

Figure 1: Schematic representation of language shift: as people stop using the language, the area of use of the language shrinks over time, resulting in dispersed "language islands" in the last timestep.

In the past few years, computer simulations and mathematical models have been introduced as tools to study language shift. These techniques allow us to track the development of languages over time and space, and can help recognize trends on a large scale – given that we have enough high-resolution data.

In this talk, we will give an overview on how to use mathematical models inspired by physics to model language shift, using concrete examples. We will look at language shift from two perspectives: macroscopically (looking at the whole population of a country) and microscopically (looking at individual people and villages). On the basis of empirical data from scenarios such as one of the many language contact areas in the former Austria-Hungary [2], we show how mathematical modelling can help us better understand why people change their language from one to another.

References

[1] K. Prochazka, G. Vogl: *Are languages like atoms? On modelling language spread as a physicist*. Glottotheory **9**(1), 77–88 (2018).

[2] K. Prochazka, G. Vogl: *Quantifying the driving factors for language shift in a bilingual region*. PNAS **114**(17), 4365–4369 (2017).

Katharina Prochazka is a post-doctoral researcher at the Department of Slavonic Studies at the University of Vienna. She works within the project "German in the context of the other languages of the Habsburg state (19th century) and the Second Austrian Republic" which is part of the FWF Special Research Programme "German in Austria (DiÖ). Variation – Contact – Perception". Previously, she studied linguistics and physics at the University of Vienna, obtaining master's degrees in both subjects. She then completed her dissertation at the Faculty of Physics which brought together both fields by using techniques from physics to model language shift. As a physicist, she is trained in solid state physics and materials science, particularly in scattering methods (small angle X-ray scattering). As a linguist, she is interested in (historical) sociolinguistics, language contact, and quantitative linguistics. Her current research focuses on using quantitative methods and mathematical modelling to study language contact in Austria-Hungary. This includes the examination of sociological phenomena such as language shift/spread (people and societies changing their language), measuring the influence of non-linguistic factors on language use and interpreting discrepancies in the data.

Gero Vogl is Professor emeritus at the University of Vienna, Austria. As group leader at the Technische Universität München and then as professor at the Freie Universität Berlin, later at the Universität Wien and at the Hahn-Meitner-Institut Berlin he has been studying diffusion in solid material, in particular metals, on an atomistic basis, introducing various methods for pinning down the elementary jump process of single atoms. With his coworkers he also studied concomitant lattice vibrations which are the motors for diffusion. These methods were introduced from nuclear physics (Mössbauer effect), neutron (quasielastic and inelastic neutron scattering) and X-ray physics (nuclear resonant scattering of synchrotron radiation and XPCS). Many of these applications were continued and perfected by his former coworkers, now leaders of their own groups in Germany, Austria and Japan. In recent years Vogl has changed his interests to studying diffusion in non-physical systems with physico-mathematical methods, in particular the spread of neophytes (invading plants) and recently the spread and retreat of languages. Gero Vogl has been president of the Austrian Physical Society, he is corresponding member of the Sächsische Akademie der Wissenschaften.