

What determines the geographical pattern of human dialects?

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The spatial variation in human dialects is the result of many significant historical events, but is driven on a small scale by vast numbers of individual interactions between millions of people. The study of the resulting spatial patterns of language use has become a quantitative discipline, making use of modern computational and statistical techniques. Borrowing ideas from Statistical Mechanics, here we formulate a theory which connects the language interactions of individuals to the macroscopic (geographical scale) structure of dialects. We find that transition regions between dialects experience a two-dimensional form of the surface tension effect seen in bubbles: they tend to get shorter, but this effect is mediated by variations in population density which induce curvature. Our theory predicts that the shape of coastline (or other borders), and the distribution of population act as an “invisible hand” driving many complex spatial patterns of dialect use toward a small number of stable configurations. We apply our theory to Great Britain, producing results which closely resemble observations and predictions of dialectologists.