A spelling net for a phrase consists of the multigraph whose points are labelled with the set of distinct letters in the phrase and whose lines lie on the Eulerian path obtained in "spelling out" the phrase between the (lettered) points. Spelling nets can also use phonemes or words as labels. An eodermdrome is a non-planar spelling net. Thus, the study of structural properties of eodermdromes is the study of non-planar Eulerian multigraphs.

In this paper we summarise what is known about eodermdromes and indicate how the properties of eodermdromes have potential for linguistic research. Some of the questions with interesting linguistic implications can be asked as questions about crossing numbers of graphs. We give 21 line critical graphs with crossing number 2 which belong to a set conjectured to characterise graphs with crossing number at most 1.

1. INTRODUCTION

A spelling net of any word or phrase consists of a labelled multigraph whose point labels are the set of distinct letters in the word or phrase and whose lines lie on the Eulerian path obtained in "spelling out" the word or phrase between the (lettered) points. Punctuation and spacing are ignored. Thus, the following
phrase in old Polish [7;p.10]

\[\text{WRÓG WARGA ÓW}\]

[translation: "the enemy of Warga"]

generates the spelling net in Figure 1

\[\text{Figure 1: The spelling net generated by WRÓG WARGA ÓW.}\]

An eodermdrome is a non-planar spelling net. Consequently, the spelling net associated with the above example is an eodermdrome since the underlying graph of the spelling net is $K_5$. Our interest in this case is that $K_5$ offers the eodermdrome of least order and least size (that is, fewest points and fewest lines) [7]. It is an amusing exercise to obtain grammatically meaningful $K_5$ eodermdromes. Examples can be found in [1,7]. A collection of all known examples is available [3].

Some English $K_5$ eodermdromes are:

TEARS AT REST; STRAY SATYRS; SWEAT WASTES; EASY TEST? AYE;
SHOES ON HENS; SCIENCE SINS.

In old Chinese [1]:

\[\text{知吾唯足無知唯無吾足知}\]

\[\text{CHI WU WEI ZU WO CHI WEN WO WO ZU CHI}\]

[translation: "That I know self denotes: Just to fill nothing and to know nothing is to satisfy myself"]

and in Hebrew:

\[\text{הלמה מה דלמה}\]

[Pronunciation: Hah'lah'mah'dih'tah mah dahl'tah]

[translation: "Did you learn what her door is?"]

We have examples of $K_5$ eodermdromes based on syllables and phonemes respectively, rather than letters as in the English examples. Spelling nets can also be constructed with words as the basic unit. For example, a $K_5$ English spelling net is formed by the words [7]:

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