Metaphor in the digital age:
Opening the flood-gates

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ABSTRACT

The digital age and recent developments in historical lexicography bring exciting new possibilities for the study of metaphor, in relation to both the scale of analysis and the identification of linguistic and conceptual patterning that was previously hidden from view. This article illustrates this by using the "Metaphor Map of English" to investigate metaphor in the semantic field of moving water. The Metaphor Map offers an unparalleled overview of the place of metaphor in the recorded language history of English and across semantic space, as it takes as its source of data the entire *Historical Thesaurus of English*, itself largely based on the *Oxford English Dictionary.* This semantic field (labelled 'Tides, waves and flooding' in the Metaphor Map) is a productive source of metaphor, and has been since the Old English period, and is also, though less commonly, the target of metaphor. It reveals a clear picture of the complex interrelationships between semantic categories and the ripples of metaphor development over time.

Keywords: metaphor, *Historical Thesaurus of English*, Metaphor Map of English, lexicography, semantics, digital humanities.

1. Introduction

The digital age is an exciting time for linguistics. Early advances in computer technology in the second half of the twentieth century made the growth of corpus linguistics possible. This opened up new perspectives on language in text and a better understanding of, for example, lexicogrammatical patterning, collocation and semantic prosody, phenomena which could only be glimpsed hazily before corpus analysis tools allowed us to manipulate

text in large quantities and move away from a purely linear reading of texts. As corpus linguistics has expanded and arguably blended with the newer, broader endeavour of Digital Humanities, new possibilities for the analysis of language and text have come to light.

The digital analysis of the data contained in large-scale reference works such as dictionaries and thesauruses is part of this. The project that forms the focus of this article is of exactly this type: 'Mapping Metaphor with the *Historical Thesaurus*'[1] (henceforth 'Mapping Metaphor') exemplifies what we can do when we have a complete historical thesaurus of a language, in the digital age.[2] Mapping Metaphor draws on the entire contents of the *Historical Thesaurus of English*, and indirectly on the material contained in the *Oxford English Dictionary* (*OED*, 2nd edn.), to map out metaphor in English across semantic space and over time. In short, it aims to establish the place and role of metaphorical word senses in the language system of English.

The Mapping Metaphor project identified nearly 12,000 metaphorical connections between the semantic categories of the *Historical Thesaurus*. While this article will give a brief overview of the picture of metaphor as a whole, clearly we cannot do justice to the richness of the resource here. Therefore, we will narrow in on a single semantic category and focus on metaphor in that category as it relates to time and semantic space. This category, named 'Tides, waves and flooding', pulls in the lexical material from the *Historical Thesaurus* relating to a number of types of moving water (not including rivers and streams which sit in an adjacent category and are metaphorically rich in their own right). As we will see, some metaphors in 'Tides, waves and flooding' are long-standing and traceable back to Old English; others have emerged at different points in the history of English. The category as a whole is neither one of the most densely packed with metaphor, nor one in which the extent of metaphor is slight. Rather it

represents a semantic area with a moderate amount of metaphor that has permeated and characterised the English language over a long time.

2. Metaphor and the *Historical Thesaurus of English*

To use a metaphor appropriate to our focus here, the *Historical Thesaurus of English* represents a high-water mark in historical lexicography. It was created, under the direction of Professor Michael Samuels and then Professor Christian Kay at the University of Glasgow over a period of 45 years, leading to print publication of the complete *Historical Thesaurus* in 2009 (Kay et al. 2009), and work continues, with subsequent versions made available online (*Historical Thesaurus of English* online). In essence, the *Historical Thesaurus* presents the entire contents of the *Oxford English Dictionary* (2nd edn.), supplemented for the earlier period by *A Thesaurus of Old English* (Roberts – Kay 1995), organised in a complex hierarchical semantic system.

The possibilities that the *Historical Thesaurus* opens up for research into lexis and meaning, synchronically and diachronically, are endless. What we saw in it, however, was a way of viewing the extent and complexity of metaphor in the language system of English across the history of the language. This became the aim of the Mapping Metaphor project.

The *Historical Thesaurus* has a number of qualities that made it an ideal starting point for the pursuit of metaphor. Most important – indeed the *sine qua non* – is its semantic organisation. The lexical items in the *Historical Thesaurus* are arranged into a complex hierarchy of 225,131 nested semantic categories.[3] At the highest level, there are three primary divisions, The External World, The Mental World and The Social World. These are broken down into, or made up from, depending on one's perspective, 37 second-level divisions (major semantic groupings such as Animals, Emotion and Morality), 377 third-level divisions (broadly 'basic' semantic categories such as Fish, Anger and Virtue) and so on down to a maximum of twelve levels, depending on the category in question. In fact, this hierarchy proved to be too complex for the purposes of Mapping Metaphor, and instead we flattened the structure, incorporating only the highest two divisions exactly, and collapsing all the lower divisions into a slightly adapted third level.

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[3] Figures for the *Historical Thesaurus* relate to version 4.0, which was the version that initially informed the Mapping Metaphor project. Full details of version changes can be found at https://ht.ac.uk/versions-and-changes/ (accessed July 2019).

The other qualities of the *Historical Thesaurus* that make it suitable for investigating metaphor are its sheer size and its long time-span. It encapsulates the entirety of semantic space – all concepts that have been lexicalised in English and recorded in the *OED*, from the first of the third-level divisions, 'Region of the earth', to the last, 'Dancing', and everything in between. In the version of the *Historical Thesaurus* used for Mapping Metaphor, this includes 793,742 word senses. In terms of time-span, the lexemes in its scope extend from the eighth century to the present day, roughly 1300 years of English. The early materials include items attested in the standard dictionaries of Old English on which the *Historical Thesaurus* drew for the period before c1150, especially Bosworth – Toller (1898) and Clark Hall – Merritt (1960). This very broad historical sweep allows us to see metaphor across an extended period of time.

2.1 Identifying metaphor

Using this dataset, the project team's aim was to identify all the systematic metaphorical connections that speakers of English have made since the earliest times of the language. The guiding principle was that patterns of metaphor could be identified from considering the lexical items that appear in two or more semantic categories of the *Historical Thesaurus*. That is, the project exploited the polysemy created by metaphor. For example, the polysemous word forms *rain*, *tempest*, *cloudy* and *storm* appear in several semantic categories of the *Historical Thesaurus*. Significantly, they all appear in semantic categories related to Weather (the source domain) and Emotional suffering (the target domain). This suggests a robust metaphorical connection between the concepts of weather and emotion. The individual words also appear in other places, however: *cloudy* appears in semantic categories relating to Intelligibility (where it is metaphorical and has the sense 'abstruse', 'obscure') and *rain* appears in semantic categories related to Abundance (where it is also metaphorical and relates to a profusion of something).

The process involved breaking the *Historical Thesaurus* data down into 415 semantic categories of similar levels of generality, e.g. Weather, Emotional suffering, Sight, Taste, Music, Excitement, and so on, and then automatically comparing all the lexical entries in every category with all the lexical entries in every other category, thus creating sets of shared lexis for every pair of categories. The following stage was to work through all of these data files to identify where this shared lexis was due to metaphor. There are various

reasons why word forms appear in more than one semantic category, and metaphor is only one of these, alongside homonymy and forms of polysemy other than that motivated by metaphor. So for example, *rain* appears not only in categories of Weather, Emotional suffering and Abundance, but also in Farming where it denotes a narrow strip of land. This last sense is however homonymous with the others and comes, as the *OED* notes, from a borrowing from early Scandinavian (*OED rain* n.2) whereas the sense related to water vapour is an unrelated word inherited from Germanic (*OED rain* n.1). There is no semantic connection, let alone a metaphorical connection, merely an accidental identity of word forms. The metaphor identification stage of the process was largely manual and very time-intensive, as while computers are invaluable in the pattern-matching task of identifying repeated lexis, they are not good at identifying metaphor.

Of course, humans also struggle with identifying metaphor, or at least agreeing on what is metaphorical and what is not. Caballero and Ibarretxe-Antuñano have expressed this succinctly as follows: "metaphoricity may be seen as a matter of degree: not all metaphorical language is regarded as such by all people, underlining the role of context and social convention in metaphor awareness and identification" (Caballero – Ibarretxe-Antuñano 2013: 274).

It is not surprising, of course, that metaphor should be a matter of degree; if we take a prototype approach to language, we expect "fuzziness and gradualness" (Taylor 1995: 121). To the social and contextual differences that Caballero and Ibarretxe-Antuñano mention, we can also add the further difficulties that arise when handling historical language data. While language users may have a good (if not always conscious) feel for metaphorical usage in the language of their own time, there are more significant limitations when it comes to historical language.

As a project, therefore, we took quite an inclusive approach to metaphor, established a team of coders with various types of expertise and specialism, and also built a lot of cross-coding and cross-checking into our procedures from the outset. In the first main stage of analysis, all category pairs were coded twice (once from the start-point of one category, and once from that of the other), normally by different coders. All category pairs were then also checked by an independent checker. Then, in a final stage, we reviewed all of the metaphorical connections that we had identified in the earlier stages, and, again basing our deliberations on the evidence of the *Historical Thesaurus* and *OED*, selected lexical examples to substantiate each metaphorical connection, identified the source and target category in each

case (that is, established the directionality of the metaphor), and identified the date of the earliest evidence for each metaphor.

While the project team's understanding of metaphor is of course heavily influenced by the notion of a conceptual metaphor and by conceptual metaphor theory, which has been the dominant approach to metaphor in recent decades, the metaphors identified in our data are not all metaphors in the sense most familiar in conceptual metaphor theory, namely Lakoff and Johnson's TARGET IS SOURCE formulation (1980), of which LIFE IS A JOURNEY is probably the most famous example. Rather, they are more appropriately described as 'metaphorically related category pairs'. For example, the metaphorical connection between the semantic category 'Relative position' and 'Prosperity and success' cannot be summed up by a single TARGET IS SOURCE conceptual metaphor. The lexical items shared by those semantic categories suggest the presence of at least two conceptual metaphors within this metaphorically related category pair: a dominant metaphor PROSPERITY IS UP (instantiated by items such as *height*, *up*, *upward* and *top*) and a less strongly evidenced conceptual metaphor that we might call, perhaps somewhat awkwardly, PIONEERING IS BEING AT THE FRONT OF A MOVING OBJECT (instantiated by *leading edge*, which has the metaphorical sense of being in the vanguard of technological development). This lack of one-to-one correspondence between metaphorical connections that hold between semantic categories in a thesaurus and Lakoffian conceptual metaphors is a result of the data-driven and bottom-up nature of the Mapping Metaphor methodology, and the heavy reliance on the semantic categories developed, also through a bottom-up process, in the *Historical Thesaurus*.

As metaphor is a matter of degree, a key question here is how we knew when what we were seeing in our data was indeed metaphor. As a project team, we found ourselves constantly considering the nature and boundaries of metaphor. While there is significant recent work on criteria for identifying metaphor, much of this stems from research into metaphor in text or discourse and does not transfer well to research on metaphor in the language system (see in particular the Metaphor Identification Procedure (MIP) developed by the Pragglejaz Group 2007, and its refinement MIPVU, developed at the Vrije Universiteit, Amsterdam, see Steen et al. 2010). Nevertheless, we had various types of information to draw on to evidence metaphorical connections. No type was sufficient in itself, but together they gave us confidence in the metaphorical nature of connections.

One of the main types of support for a metaphorical connection came from the *Historical Thesaurus* and *OED* attestation dates for word senses. That is, we expected to see historical priority for literal senses and later dates

for extended, metaphorical word senses. As no reference work draws on absolutely comprehensive evidence of language in use, however, there is always the possibility that expected ante-datings are missing and we cannot always trust apparent historical priority. Similarly, we could draw with some confidence on the typical concrete-abstract directionality of metaphorical extensions as a clue to a metaphorical connection between categories but had to combine this information with human judgement. Concreteness and abstraction are relative notions, are frequently argued over by metaphor scholars (for a discussion see Dancygier – Sweetser 2014: 64-67) and do not neatly apply to all types of transfer, including those between concrete concepts (what the *OED* calls 'transferred' as opposed to figurative senses).

A major clue to the presence of metaphor lay in the patterns that emerged from looking at whole sets of lexical data together. There was stronger evidence for a systematic metaphorical connection between categories if it could be seen to be instantiated in several words. This can be illustrated with a small sample of data.

Table 1. Selection of data from 'Tides, waves and flooding', showing lexical items that also appear in 'Prosperity and success'

Lexical item	Part of speech[1]	Attestation dates	Sense
Rise	n	1721-	Advancement/progress
tide-wave	n	1861	..significant
tidal-wave	n	1884-	..significant
rising	n	1595-	.rise in prosperity/power/rank
rising	aj	1631-	.rising in prosperity/power/rank
silver	aj	1659/60	..of times/places
rise	n	1632-	.rise in prosperity/power/rank
increase	vi	1388-1722	.rise in prosperity/power/rank
rise	vi	1303-	.rise in prosperity/power/rank
buoy	vi	1709 + 1742 fig.	.rise to the top
peak	n	1902-	..highest point
high-water mark	n	1814-	..highest point

[1] In the Part of speech field, n = noun; aj = adjective; vi = intransitive verb. In the Attestation dates field, a dash after a date indicates that a sense remains current, and 'fig.' indicates a figurative sense. In the Sense field, dots before a sense gloss indicate hierarchical level.

Table 1 shows a small snippet of the data on which the Mapping Metaphor team drew when establishing a metaphorical connection between the categories 'Tides, waves and flooding', and 'Prosperity and success'. On the left, it shows a set of lexical items that appear in both categories. The other three columns all relate to each lexical item in the second category, 'Prosperity and success', and show its part of speech, the attestation dates for the particular sense of the lexical item in the second edition of the *OED*, and an indication of the sense in that category, drawn from the most immediate sense heading in the *Historical Thesaurus* hierarchy (fuller sense information could be readily accessed when needed). It is clear from this that, just as one would expect, there is a metaphorical connection between the two categories in question, with a number of words with literal senses in 'Tides, waves and flooding' being used with extended, metaphorical senses in 'Prosperity and success': *tide-wave*, *tidal-wave* and *high-water mark* stand out particularly. This connection is perhaps also supported by *buoy*, although one might argue that the source category for *buoy* is 'Navigation', found within the later Social World division, rather than 'Tides, waves and flooding'. The connection between 'Tides, waves and flooding' and 'Prosperity and success' is particularly clear-cut; in other cases, the process of identifying metaphorical connections was less straightforward, either because there were very few lexical items instantiating the connection or because the list of lexical items shared by the two categories was so extensive that identifying the metaphor was challenging.

2.2 The Metaphor Map of English

The identification and analysis of metaphor outlined above allowed us to create the project's online resources. These are the Metaphor Map of English (henceforth MME, based on the *Historical Thesaurus* data drawn originally from the *OED*) and the Metaphor Map of Old English (MMOE, based on the various data sources that come together as *A Thesaurus of Old English*). It was decided to create separate Maps for these time periods both because the data come from two quite different types of source and because the two sets of data are quite different in scale, bringing the risk that the very substantially smaller set of OE data could be swamped by that from the later period. Fig. 1 shows the interface of MME.

In Fig. 1, all of the 37 second-level categories are shown around the outside of the circle: working clockwise from the top, categories 1A to 1Q
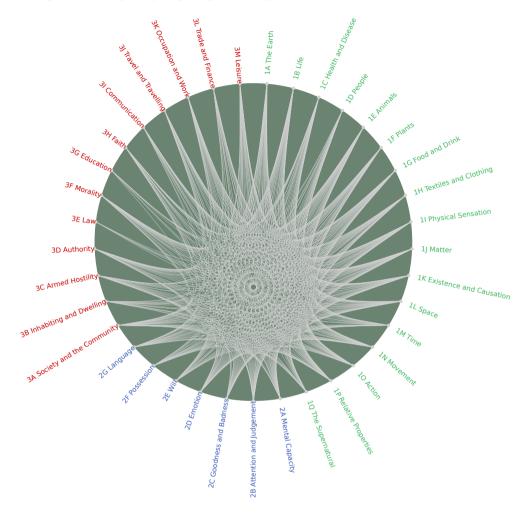
Figure 1. Metaphor Map of English, top-level view

represent the External World, 2A to 2G represent the Mental World, and 3A to 3M represent the Social World. Each category can be expanded to show its component third-level categories, which number 415 in total. The Metaphor Maps allow the user to see the detail of all of the metaphorical category connections that the project identified. Fig. 2 shows an expanded version, with third-level category 'Tides, waves and flooding' (which has the identifying code 1A13) opened up, and the high-level metaphorical links with second-level categories highlighted in yellow. Users can click on the yellow links to see further detail of the third-level categories with which 'Tides, waves and flooding' has specific metaphorical connections.

Figure 2. Metaphor Map of English, showing links to and from 'Tides, waves and flooding'

3. Metaphor across space and time

Section 4 below will focus on metaphor in one particular semantic category, 'Tides, waves and flooding', which was used to illustrate the Metaphor Maps above. First, however, it is useful for context to gain a sense of the scale of the Metaphor Maps by briefly surveying the picture that they show of metaphor across semantic space and over time.

Considering metaphor across semantic space, MME records around 12,000 metaphorical connections between semantic categories, and MMOE

records around 2,500. These are not evenly distributed across semantic space, however. Table 2 shows the ten categories in MME and MMOE, respectively, that enter into the largest numbers of metaphorical category connections. Category codes are given, to allow a better understanding of how each category fits into the overall Mapping Metaphor structure. The first letter of the code indicates the primary division (1 = The External World; 2 = The Mental World; 3 = The Social World), the following letter indicates the second-level category (e.g. 1L codes second-level category Space, which lies in 1 The External World), and the final pair of numbers indicates the third-level category.

Table 2. Categories with the highest numbers of metaphorical category connections

Metaphor Map of English (MME)		Metaphor Map of Old English (MMOE)	
Category code and name	Number of metaphorical category connections	Category code and name	Number of metaphorical category connections
1L04 Shape	245	1L06 Relative position	132
1G01 Food and eating	242	1L04 Shape	97
1L06 Relative position	233	1N06 Movement in a specific direction	95
1F01 Plants	217	1L03 Size and spatial extent	80
1L03 Size and spatial extent	201	3H01 Faith	62
1B11 Body parts	190	1F01 Plants	60
1N06 Movement in a specific direction	186	1B11 Body parts	58
1E09 Birds	179	1C02 Ill-health	54
1A28 Atmosphere and weather	177	1G01 Food and eating	52
1J03 Weight, heat and cold	171	1L05 Place and position	51

As can be seen here, there are four categories in MME which are part of a metaphorical connection, as either the source or the target of metaphor, with more than half of the other 414 categories: 'Shape', 'Food and eating', 'Relative position', and 'Plants'. In MMOE, the numbers of metaphorical

connections are much lower, owing to the smaller data set, and only 'Relative position' is part of more than 100 metaphorical connections, though 'Shape' and 'Movement in a specific direction' come close. Notably, seven of the ten most metaphorical categories in MME also appear in the equivalent list for MMOE, suggesting a continued strong place for metaphor in these semantic areas across the lifetime of the English language. As the categories are not of equal size with respect to the number of lexical items that they contain, it is also useful to look at normalised figures to see where in semantic space metaphor is most dense. Table 3 shows the ten categories in each of the two Metaphor Maps with the highest number of metaphorical connections per 100 lexical tokens.

Table 3. Categories with the highest numbers of metaphorical category connections per 100 lexical tokens

Metaphor Map of English (MME)		Metaphor Map of Old English (MMOE)	
Category code and name	Metaphorical connections per 100 lexical items	Category code and name	Metaphorical connections per 100 lexical items
1J08 Strength	45.39	1J08 Strength	141.67
1J10 Hardness	33.00	1A18 Universe and space	111.11
1I09 Touch	32.19	1J11 Softness	100
1B05 Absence of life	30.56	1J10 Hardness	83.33
1J31 Fireworks	29.23	3A01 Society	83.33
1J09 Weakness	28.02	1B23 Vascular system	71.43
1J27 Illumination	25.50	1J05 Lack of density	66.67
1B09 The human body	24.69	1J32 Transparency and opacity	66.67
1A18 Universe and space	24.62	1D06 Adult and middle-aged person	64.71
1B28 Manner of death	24.58	1J09 Weakness	64.71

The categories in Table 3 are quite different from those in Table 2, showing that the largest categories are not generally the most metaphorically dense. Again, however, there is considerable overlap between MME and MMOE, with four of the top ten in common. Particularly notable are 'Strength' and

'Hardness', in which metaphor appears as highly prevalent consistently from Old English onwards.[4]

Viewing the data over time, around two-thirds of the metaphorical category connections found in Old English are maintained into the later period, and many new metaphorical connections emerge continuously over the centuries that follow. Table 4 gives an overview of new metaphorical category pairs for each fifty-year period in MME.

Table 4. New metaphorical connections across time in the Metaphor Map of English

Period	Number of		
	new connections	of which strong / (%)	of which weak / (%)
Old English	779	610 (78.31%)	169 (21.69%)
1150-1199	41	30 (73.17%)	11 (26.83%)
1200-1249	335	234 (69.85%)	101 (30.15%)
1250-1299	144	97 (67.36%)	47 (32.64%)
1300-1349	514	342 (66.54%)	172 (33.46%)
1350-1399	778	447 (57.46%)	331 (42.54%)
1400-1449	529	266 (50.28%)	263 (49.72%)
1450-1499	304	137 (45.07%)	167 (54.93%)
1500-1549	788	374 (47.46%)	414 (52.54%)
1550-1599	1623	593 (36.54%)	1030 (63.46%)
1600-1649	1283	307 (23.93%)	976 (76.07%)
1650-1699	695	134 (19.28%)	561 (80.72%)
1700-1749	419	75 (17.90%)	344 (82.10%)
1750-1799	381	55 (14.44%)	326 (85.56%)
1800-1849	856	116 (13.55%)	740 (86.45%)
1850-1899	1078	79 (7.33%)	999 (92.67%)
1900-1949	882	61 (6.92%)	821 (93.08%)
1950-1999	453	17 (3.75%)	436 (96.25%)
Total	**11882**	**3974**	**7908**

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[4]   Note, however, that factors such as text scarcity for Old English may obscure other categories that may have been similarly prevalent.

It further breaks these connections down into 'strong' and 'weak' connections. The distinction between strong and weak metaphorical connections is not a precise measure, but an assessment of relative strength by the coding team, taking account of the extent of the lexical evidence for a metaphorical connection and its presence in a range of genres, as opposed to isolated occurrences in a specialised genre such as poetry.

4. Tides, waves and flooding

We can look at both of these axes – semantic space and time – from the perspective of an individual category. 'Tides, waves and flooding' is one of 415 categories in the Metaphor Maps. Its code, 1A13 indicates that it sits in the first primary division, the External World, and the first second-level category The Earth. Here it sits alongside other third-level categories such as 'Lakes and pools', 'Ice', 'Minerals' and 'Named regions of earth'. Semantically, the category contains the component of the *Historical Thesaurus* that concerns water as it moves in relatively natural and uncontrolled ways, specifically the subcategories of the *Historical Thesaurus* listed in Fig. 3.

Flowing; Flow/flowing; Flow; Cause to flow; Current; Tide; Tidally; Type of tide; State of sea; Have/be in specific kind of motion; Direction of sea; Wave; Move in waves; Pour in waves; Foam/surf; Form surf; Movement of waves; Move restlessly about; Whirlpool; Turn into whirlpool; Sudden rush of water; Rush; Flood/flooding; In flood; Flood/overflow; Structure protecting from water/flooding; Flowing water

Figure 3. The semantic scope of the category 'Tides, waves and flooding'

'Tides, waves and flooding' enters into a metaphorical connection with 108 other categories in the Metaphor Map of English (that is, about a quarter of the others) and 26 of the other categories in the Metaphor Map of Old English. Clearly, therefore, there are a number of very long-standing metaphorical connections that can be traced back to the earliest stages of the language; there are also many connections which appear as new on the basis of the evidence we have and much new lexical evidence for existing connections emerging in every century up to the present. We can get a sense from this of waves of metaphor development over time.

Some categories in the Metaphor Map can be characterised as predominantly providing the source of metaphor (for example, 'Food', 'Birds', 'Plants', 'Body parts' – notably concrete/tangible concepts), and others as being the target of metaphor (for example, 'Emotional suffering', 'Behaviour and conduct' – notably abstract concepts). 'Tides, waves and flooding', like many other categories, has a mixed profile, though in this case with a strong tendency towards being the source of metaphor. Let us look at each of these briefly, and then at the more complex cases where 'Tides, waves and flooding' apparently enters into bidirectional metaphorical connections with other categories.

4.1 'Tides, waves and flooding' as source

'Tides, waves and flooding' is more typically the source than the target of metaphor, as one would expect from a category in the second-level category The Earth, which predominantly contains concepts of material things. In MME, lexical items from 93 other categories have been identified as instantiating a metaphorical connection in which 'Tides, waves and flooding' is the source. In MMOE, there are 17 such categories. It should not perhaps come as a surprise that metaphors with a source in 'Tides, waves and flooding' should be so prevalent in British English, given the importance of water in a country with a significant coastline. These metaphors are also very long-standing: for example, Potter (1988) has studied the use of *wylm* ('that which wells up or surges') and *weallan* ('to well') in the Old English epic poem *Beowulf*, where it provides the source of a pervasive emotion metaphor:

> It is, in fact, establishment of a correspondence between the elemental matter of water or fire and the throbs of the human heart, in waxing and in waning, which makes the *wylm-weallan* word-complex not only generally poetic and imagistically creative, but precisely metaphoric, a sophisticated poet's handle on an immemorial knowledge. (Potter 1988: 192)

In cases where 'Tides, waves and flooding' is the source, the respective target categories can be seen to fall into groups, drawing especially on (1) light (in the period covered by MME), (2) movement, and (3) emotion, and we can also pick out a further loose grouping (4) of a large number of connections with miscellaneous abstract categories. The examples below

demonstrate this, giving a sample of target categories in MME, MMOE or both, and instances of the metaphorically-related lexical items that connect the categories, together, where necessary, with a brief explanation of the sense as it relates to each target category.

(1)   *Light*

1J25 Light	(MME) *streaming*; *streamy*; *flood* [movement of light is like movement of water]
1J27 Illumination	(MME) *stream* [as above]
1J30 Artificial light	(MME) *flood* [as above]

(2)   *Movement and position in space*

1L06 Relative position	(MMOE) *flowan*; (MME) *conflux*; *gulf* [movement of people]
1N02 Types of movement	(MME) *maelstrom* [irregular movement like intensive movement of water]
1N03 Progressive movement	(MME) *flow*; *stream*; *surging*; *surge* [forward movement like water]
1N06 Movement in a specific direction	(MMOE) *weallan*; (MME) *flow<flowan*; *flood-gate* [copious emission of things like movement of water]
3J01 Travel and journeys	(MMOE) *flowan*; (MME) *flow*; *flowing*; *flux*; *flood*; *conflux*; *stream*; *afflux*; *float* [movement of vehicles like movement of water]
3J02 Transport	(MME) *surge*; *tidal* [movement of traffic like movement of water]

(3)   *Emotion*

2D01 Emotion	(MME) *flow*; *pour*; *wave*; *tidal wave* [exhibit emotion; rising of emotion like movement of water]

2D02 Strong emotion/lack of emotion	(MMOE) *wielm*; *weallende* [violent emotion like rolling movement of waves][5]
2D03 Excitement	(MMOE) *afysed* [excited, from agitated water] (MME) *set afloat*; *ground-swell*; *wave*; *splash* [nervous excitement from movement of water][6]
2D06 Emotional suffering	(MME) *flood-gate* [source of tears]
2D07 Anger	(MMOE) *wielm* [strong emotion from movement of waves]

(4)   *Miscellaneous abstract concepts*

1B26 Death	MME) *billow* [death as overwhelming flood]
(1K01Existence and its attributes	(MMOE) *upspring* [come into existence]; (MME) *insurge* [come into existence]; *current*; *stream* [in line with prevailing tendency]
1K04 Causation	(MME) *backwash* [unintended consequences]
1O07 Completion	(MME) *seventh wave* [culminating act]
1O11 Difficulty	(MME) *flood-gate* [that which can prevent]; *vortex* [something from which it is difficult to be extracted]; *cross-current* [an opposing force]

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[5]   Kövecses (2010: 108) notes that EMOTION IS A NATURAL FORCE is a typical conceptual metaphor that characterises emotion, and that HAPPINESS IS A NATURAL FORCE is a more specific related metaphor. For more on the close metaphorical links between intense emotion and water, see also Omori (2008) who finds "the most plausible source concept for characterizing the uncontrollability of emotion is A HUGE MASS OF MOVING WATER IN THE NATURAL WORLD" (2008: 137). Omori also suggests that the concept is significant across cultures and confirms that Japanese speakers also "have a wealth of words for expressing emotion in terms of A HUGE MASS OF MOVING WATER" (2008: 139).

[6]   For a more detailed discussion of metaphors of Excitement, see Anderson (2016).

1O16 Prosperity and success	(MME) *overflow* [go beyond bounds]; *high-water mark* [highest point of something]; *tide-wave*; *tidal-wave* [significant advancement or progress is like movement of water *en masse*]
1O18 Adversity	(MMOE) (*ge*)*drefan* [to afflict, from movement of agitated sea]; (MME) *ebbing*; *ebb* [fall from prosperous condition]; *low-water-mark* [lowest point of something]
1P29 Sufficiency and abundance	(MMOE) *walling < weallende*; *wall with < weallan*; *flow < flowan*; (MME) *flood*; *affluent* [abundance of water transferred to general abundance]
3D05 Authority, rebellion and freedom	(MME) *insurge* [rise in revolt]; *with the stream* [submissive]; *cataclysm* [political unrest, from the Great Flood or deluge]; *undam* [free from restraint]

In almost all cases, it is the characteristic movement of water, with more or less force, that is at the heart of the metaphorical connection. This is true also of the metaphors that have their source in the category 'Rivers and streams'. Metaphors with their source in other water categories in the Metaphor Map, such as 'Body of water' and 'Sea', however, highlight other features of water, such as the vast size of a body of water, its depth or shallowness, or its freshness or stagnancy. Taken together, the evidence of the water categories support Mittlefehldt's statement that "it is this multifaceted quality of water that makes it so appropriate as a metaphor for our creative selves" (2003: 139).

4.2 'Tides, waves and flooding' as target

'Tides, waves and flooding' is much less commonly the target of metaphor than the source. Nevertheless, there are various ways in which the concepts contained in this category are expressed in metaphorical terms. In MME, lexical items from 23 other categories have been found to instantiate

a metaphorical connection in which 'Tides, waves and flooding' is the target, and in MMOE, the corresponding figure is 10.

As with the target categories in the section above, so too here the source categories can be seen to fall into clear groupings of related concepts. These draw especially on (5) living beings and their physical characteristics, (6) abstract qualities of humans, and (7) physical characteristics of material things. The examples below show a sample of source categories, again accompanied by one or two of the metaphorically related lexical items connecting the categories, and a brief explanation of the sense as it relates to moving water.

(5)   *Physical characteristics of living beings*

1B01 Life	(MMOE) *quick* < *cwic*; (MME) *living*; *lively* [moving water is a living thing]
1B11 Body parts	(MME) *head*; *shoulder* [parts of a wave]
1B12 Skin	(MME) *wrinkled*; *dimple* [the 'texture' of water]
1E04 Animal bodies	(MME) *crest* [break with foam]
1E15 Horses and elephants	(MME) *horse* [to carry away be flooding]; *sea-horse* [a white-crested wave]
1I02 Sleep	(MME) *lull* [make water calm]

(6)   *Abstract qualities of humans*

2D07 Anger	(MMOE) *wood* < *wod*; (MME) *rage* [moving water as human emotion]
3A10 Social discord and harmony	(MME) *troublesome*; *brawling* [moving water behaves like an uncontrolled group of humans]

(7)   *Physical characteristics of material things*

1A05 Landscape, high and low land	(MMOE) *ridge* < *hrycg*; (MME) *valley* [crests and troughs in the sea]
1H01 Textiles	(MME) *frizado* [a woollen fabric, applied here to water flowing with agitated movement, producing appearance of coarse woollen cloth]

1H02 Clothing	(MME) *wimpling*; *wimple* [a stream meanders like moving fabric of a veil]; *hood* [cap of foam]
1J11 Softness	(MME) *softness*; *soft* [moving water has the appearance of a smooth texture]
1K03 Weight, heat and cold	(MME) *scalding*; *boiling* [an expanse of moving water with the 'texture' of boiling water in a pan]
3K07 Materials and fuel	(MME) *glassy*; *hyaline* [moving water with the texture of glass]

The characteristic movement of water is again key to the understanding of the metaphorical connections between the categories in question here. Water as it moves in the form of tides and waves is expressed in human terms, as conveying anger and discord. But texture and shape are also very important here, as we make sense of water in mass as bearing resemblance to other – perhaps more everyday – objects and materials.

4.3 Apparently bidirectional metaphors

Looking separately at 'Tides, waves and flooding' as source and target as we have done above, however, obscures part of the picture, as can be glimpsed from some of the examples, including 'Anger'. In some of the metaphorical category connections in the Metaphor Maps, the category of 'Tides, waves and flooding' is *both* source and target. That is, some of the category connections are bidirectional. It must be remembered, however, that we are talking here about metaphorical connections between semantic categories in the Metaphor Maps (and ultimately in the *Historical Thesaurus*), each of which contains many individual concepts, and *not* necessarily conceptual metaphors in the Lakoffian sense.

In MME, there are eight category connections in which 'Tides, waves and flooding' is both source and target, and in MMOE there is only one. The former can be illustrated by the connection between 'Tides, waves and flooding' and 'Landscape, high and low land'. Here, lexical items like *wave*, *wavy* and *surging* have their source in 'Tides, waves and flooding' and have transferred senses likening elements of the landscape to moving water, and *valley*, with the transferred sense of the trough of a wave, has its source in 'Landscape, high and low land'. In MMOE, a similar situation is found with

'Strong emotion and lack of emotion', in which *wood* (from OE *wod* 'mad') transfers to the conceptualisation of the roughness of waves, and *wielm* and *weallende* show transfer from the rolling movement of waves to violent emotion. This last example is perhaps closest to what we would think of as a truly bidirectional metaphor, in which the two sources are conceptually very close to each other and so are the two targets.

We also see category connections in which 'Tides, waves and flooding' is the source in one of the Metaphor Maps but the target in the other, that is, the directionality changes from the Old English period to the subsequent period. The category of 'Disadvantage and harm' illustrates this. In MMOE, 'Tides, waves and flooding' is the target of metaphor, instantiated by *wiþersæc* extending its meaning from a sense of unfavourableness to the collision or flowing together of waters. In MME, on the other hand, there is evidence of 'Tides, waves and flooding' as the source, illustrated by *sea-mark* (a marker of a high tide, transferred to a warning sign more generally) and *undam* (to release water, transferring to a general sense of depriving something of protection). The opposite happens with 'Social discord and harmony': in MMOE, 'Tides, waves and flooding' is the source, with the concept of contention or strife borrowing from the surging, heaving movement of waves (*gewealc*), and in MME, *troublesome* and *brawling* show transfer from social discord to the agitated flow of water. Illustrating the same shift from MMOE to MME, we can consider also 'Clothing'. In MMOE, 'Tides, waves and flooding' is the source, with the transfer being from a rolling wave (*wealca*) to a billowing flimsy fabric. In the long period represented by MME, 'Tides, waves and flooding' shows up as the target, with two clothing words transferred at different times to the rippling, meandering of water (*wimple*, *wimpling*), and to a cap of sea-foam (*hood*).

5. Conclusion

'Tides, waves and flooding' is just one of over four hundred categories in the Metaphor Map, but it gives insights into the complex interrelationships between semantic categories, and the ripples of metaphor development over time. In particular, it illustrates that while some metaphorical connections are very long-standing, traceable back to the Old English period, new connections emerge up to the present, and will no doubt continue to emerge in the future. These metaphorical connections are instantiated by lexical evidence which itself varies over time, with new words emerging to express existing connections. Considering 'Tides, waves and flooding' as

the source of metaphor, a core of words in the semantic category can be seen to reliably carry metaphorical meaning across many semantic categories and across time. This core includes words like *flood*, *flow* (and related forms such as *flowing*, *overflow*, *flux*, etc.), *stream*, *surge*, *tide* and *wave.* This is supported by a wider periphery of lexemes used metaphorically but appearing as connections between fewer pairs of semantic categories. These lexemes include *flood-gate*, *high-water mark* and *vortex*, all of which occur several times as instantiating a metaphorical connection between a pair of categories in the Metaphor Maps, and a long tail of words that have been picked out only once by the Mapping Metaphor coders as instantiating a metaphorical category connection, including *bow-wave*, *land-flood*, *sea-froth*, *tenth wave*, *tide-mark*, *voraginous*, *water-wall*, and *whirlpool*, relating to more specific concepts. These last examples relate to much more specific concepts than *flow*, *stream*, *wave* and their like: these may perhaps make for more vivid and effective metaphors, but further research would be needed to explore this.

Looking beyond 'Tides, waves and flooding', there is scope for much more detailed analysis than the Mapping Metaphor team has been able to carry out so far, both of further individual categories or set of related categories, and of how metaphor has entered and survives in the language system of English as a whole. More generally, as demonstrated by the Mapping Metaphor with the *Historical Thesaurus* project, the digital age and developments in historical lexicography bring exciting new possibilities for the study of metaphor. They are enabling us to explore metaphor at a much larger scale than before, and they allow us to look at metaphor in new ways, for example where digital resources are interconnected like the *Historical Thesaurus of English* and the Metaphor Map of English. This may be the key to future responses to some of the thorniest questions in metaphor theory, beyond the scope of this article, such as to what extent the notion of dead metaphor is meaningful, whether it is meaningful to speak of bidirectional metaphor, or whether we can more precisely define what we mean by a semantic domain by exploiting the categorisation work of a major reference thesaurus. The digital age appears to have opened the flood-gates for research into metaphor.

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