

Enumerations:
Translating Between Letters and Numbers

“What is the sum of the text?”
- Roland Barthes, S/Z

i.

The task of translation – not just that of the translator, but of translation itself – is undergoing a momentous shift today. Humanism was in many ways founded upon the notion of linguistic difference. The knowledge to be gained in moving between languages was the means of attaining a form of higher order knowledge, whether of the human or the divine. Erasmus’ bilingual New Testament might be considered one of this tradition’s founding documents.

Today, there is a new translational imperative at work, one that aims to move between letters and numbers. Translating texts into *quantities* has emerged as the overwhelming feature of our cultural moment. Instead of teasing out the subtle differences of logos and verbum or Geist and mind, we now puzzle over questions of frequency, periodicity, and spatial relations. For many, this is understood as nothing short of the colonization of the human mind – numeracy’s rise signals literacy’s eclipse, and with it a host of highly charged concepts like subjectivity, individuality, creativity, or even individual freedom. Language plays subjective foil to number’s objectivity.

The impoverished view that this takes on the history of literature and thought should be obvious. The list of philosophers who were mathematically trained is long and illustrious, from Leibniz and Descartes to Ludwig Wittgenstein, just as the centrality of number to language, story, and poetics is equally rich. Why are there nine circles of hell in Dante’s *Inferno*? 100 stories in Boccaccio’s *Decameron*? 365 chapters in Hugo’s *Les*

Miserables? 108 lines in Poe's *The Raven*? Not to mention the entire field of prosody: why is so much French classical theatre composed in lines of 12 syllables or English drama in 10? Why did there emerge a poetic genre of exactly 14 lines that has lasted for over half a millennium? Beauty, meaning, and quantity are unquestionably and indelably related.

It's not the introduction of quantity into the humanities that should be seen as an assault on the human. Rather, it's the attempt to cleave off the imbedded practices of counting and calculating from speaking and recounting that is to my mind one of the great cultural obstacles that we face today. This talk is an attempt to think about the values of translating between letters and numbers as a newly vital form of human thought.

ii.

In my talk tonight, I will be focusing on poetry, for reasons that are both motivated – poetry marks a kind of literary epicenter and therefore a good place to start for any reflection on the quantitative turn – and also personal – this is what I'm most interested in right now. I want to begin with a reading of a poem, one of those 14 line anomalies that has been with us for a long time. The poem is a sonnet by Goethe, "Powerful Surprise [Mächtiges Überraschen]," which he wrote as the opening to a sequence of sonnets that he composed upon the death of his close friend, Friedrich Schiller. Goethe only wrote sonnets during one brief phase in his entire career (which spanned over 60 years and produced over 1,000 poems), but he did so in characteristically programmatic fashion: the first sonnet tellingly ends with the words, "Ein neues Leben," a "new life," invoking both his genealogical predecessor in Dante's

Vita Nuova, as well as his personal sense of undergoing a profound biological and poetical reawakening at the age of 57.

Powerful Surprise

Ein Strom entauscht umwölktem Felsensaale
Dem Ocean sich eilig zu verbinden;
Was auch sich spiegeln mag von Grund zu Gründen,
Er wandelt unaufhaltsam fort zu Thale.

Dämonisch aber stürzt mit einem Male ---
Ihr folgten Berg und Wald in Wirbelwinden ---
Sich Oreas, Behagen dort zu finden,
Und hemmt den Lauf, begränzt die weite Schale.

Die Welle sprüht, und staunt zurück und weicht,
Und schwillt bergan, sich immer selbst zu trinken;
Gehemmt ist nun zum Vater hin das Streben.

Sie schwankt und ruht, zum See zurückgedeicht;
Gestirne, spiegelnd sich, beschaun das Blinken
Des Wellenschlags am Fels, ein neues Leben.

A stream descends from cloudy crags
Hurrying on the ocean to enjoin;
Whatsoever may reflect from ground to ground,
He wanders irreversibly down.

Demonically there falls at once --
Following hill and dale in tortured breath --
Oreas, to seek repose down below,
He checks the water's flow, confines the broaden'd bowl.

The wave sprays and staggers back and yields
And swells upward to devour itself perpetually;
The striving towards the father is now restrained.

It careens and rests, dammed back as lake;
The stars, reflecting themselves, regard the twinkling
Of the wave's pounding against the cliff, a new life.

The sonnet tells the story of the fall of a massive rock into a river, personified as Oreas, a mountain nymph. It is a chance event that leads to the creation of a new form – the rock dams the river to create a lake, thus interrupting the genealogical relationship between two bodies of water, the spring, the river's origins, and the ocean, the river's end. After the fall, we are left with a lake instead of a river, or better, a lake *within* a river, that intermittently reflects the heavens' stars in its crashing waves and it's this scene that I want to focus on:

The wave sprays and staggers back and yields
And swells upward to devour itself perpetually;

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The stars, reflecting themselves, regard the twinkling
Of the wave's pounding against the cliff's walls, a new life.

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These lines are remarkable on several levels, the first of which is the way sound and sense are so beautifully intertwined – either by way of antinomy, in the words *weich* and *Deich* for example (*weichen*, to yield or step back, and *weich* which mean soft and *Deich*, the hard, unyielding dam); or more associatively, as in the classical coupling of *Streben/Leben*, striving and life, that captures a deeply Faustian vein; and finally, they are linked through alliteration, the repetitive intonations of *sprüht und staunt und schwillt und schwankt und spiegelnd und schlag*, onomatopoeically capturing the undulations and uncertainties of the wave and its spray now bounded by the fallen rock.

I want to think more about that alliterative concatenation of all those “sch” sounds, because at the center of those words lies a concern with a tension between competing notions of dispersion and recuperation, of how dispersion could ever function as the

condition of subjective recuperation. This may sound like a very modern question but it was also a deeply Romantic one as well. Goethe will repeatedly explore the conditions of *Zerstreuung* that increasingly categorize modern life, and modern literary life in particular, at the turn of the nineteenth century – from the root *Streu*, or loose particulate matter (from which we get the English straw). Well before Benjamin popularized the notion of distraction as the condition of modern urban life, Romantic poets were wondering over the cognitive lacerations that lay in store at the dawn of our highly commercialized literary modernity.

The line addresses this question through the not unfamiliar gesture of personification, in that verb “staunt zurück,” as the wave stands back in astonishment (for which I have “staggered back,” since in English astonish and astound cannot be active verbs in reference to oneself – one is astonished, similar to the way one is silent in English, but silences in German, er schweigt). The choice of verb here is often thought to be a mistake, by none other than the great German lexicographers, the Brothers Grimm. What Goethe meant, according to the Grimms, is *staut* zurück, from *stauen* to pile up (in contemporary usage we speak of traffic as *Stau*). But if we take seriously the idea that this is not a typo – and it’s not – what Goethe does in his choice of verb is not only give the river an affective dimension, the surprise of his title, but one that is closely linked to the physics of this moment: the unceasing, repetitive movement in multiple directions and in multiple dimensions that characterizes those trapped waves. Just as in the verb *stauen*, *staunen* contains the word *Stau*, for dust (more particulate matter), so that the question that seems to be at work here, and one could find it in even more canonical passages as in Faust’s awakening before the waterfall with its rising and falling atomic

mist, is namely *the order of dispersion*, our ability to have knowledge of such dispersiveness, to imagine the form of ever expanding scales of encompassment, the unity of disunity, if you will, and what the affective state of the observer ought to be in order to receive this kind of insight.

What the sonnet enacts then at a more global level of language, of a thinking about language, is the movement away from a model of genealogical relationships (the spring giving birth to the ocean) – that is, from a necessary, and necessarily linear, connection between entities – to one premised on an idea of likeness, difference, and recursivity (embodied above all else in the parallel planes of the lake and sky and the intermittently blinking stars through which they are united). What the stars see is not only their periodic reflection in the breaking waves, but also the *imitation* of themselves in the wave's spray produced through the wall's inhibition (elsewhere Goethe will reflect on *Schaum* or foam as another form of liminal particulate matter, both liquid and atomically gaseous). In other words, we are led through the sonnet towards the spatial knowledge of form, one that is no longer temporally finite, as in the river's voyage, but recursively infinite, as in the twinkling reflection of the stars in both the visual plane of the lake and the embodied excrescences of the lake's spray. What we have on display here, I would suggest, is the move from a grammatical theory of language to what I would call a *diagrammatical* theory, from the linear accrual of hierarchical meaning to the spatial flux of intermittent reflection. And it is no coincidence that Goethe chooses the sonnet as the genre through which to imagine this future diagrammatics of the self. The poetic genre most profoundly defined by a turn, the so-called volta, is deployed here to think about the turn in one's life – life defined by the notion of the turn – conveyed through the trope of

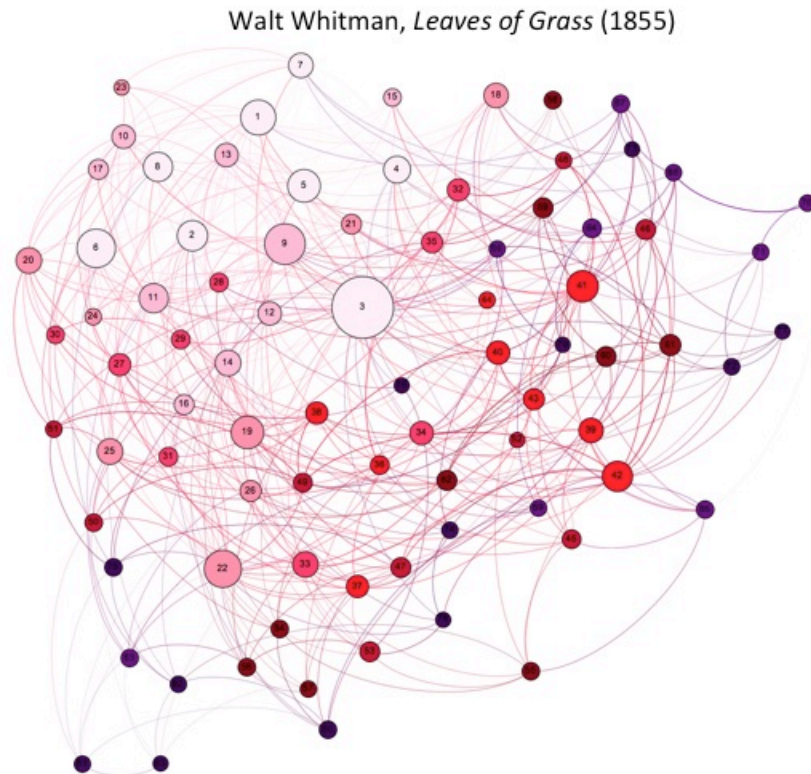
intermittent reflection, a periodicity at the heart of both language and the self. This is, for Goethe, the condition of the affective state of surprise, astonishment and wonder that is the emotional basis of the so-called new life. “Zum Erstaunen bin ich da,” Goethe writes elsewhere. I am there to wonder.

iii.

The point of this exercise is to understand the extent to which Goethe provides us with a template for thinking about poetic meaning, one that is deeply related to the new field of quantitative translation and that importantly brings with it a certain potentiality for affective response – the state of *Erstaunen*, that is, wonder or astonishment. Meaning is not, according to the sonnet, a function of genealogical derivation, of a linear and deeply hierarchical necessity. Rather, meaning is contingent upon an intermittent spatial apparition, a reception of redundancy and the periodic.

This is precisely how we are thinking about language when we model a text quantitatively today, and I think it is important to emphasize the extent to which such thinking has deep roots in the poetic record – perhaps not genealogically (Goethe’s poetry has not given birth to the quantitative), but certainly analogically, it makes possible a certain way of thinking about language that has a rich historical precedence. When we undertake the translation from letter to number, one of the most elementary ways to imagine a text as a set of quantities is to model it such that each word becomes a dimension in space and its location the aggregate of all of these dimensions. The text is no longer the outcome of linear processes, like the river’s flow, but instead a spatial system of periodic correlations. And it is this that allows us to put the text in relation to

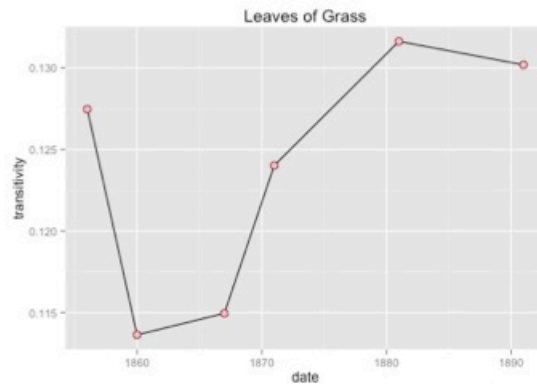
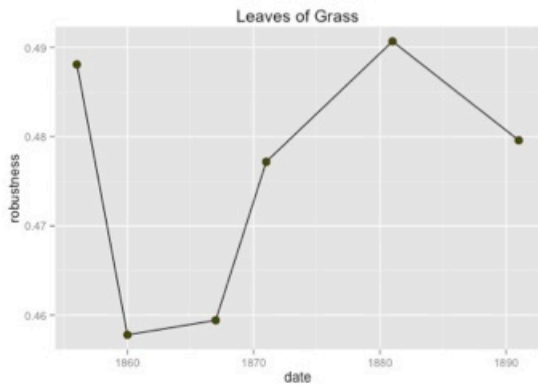
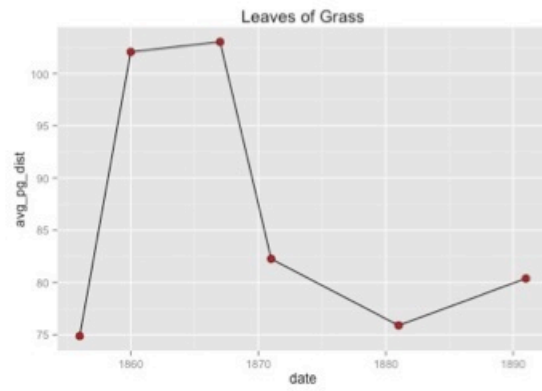
any other, where the distance between any two texts will be a measure of their geometric proximity to one another, a proximity that can indicate any number of features, whether it is vocabulary, punctuation, parts of speech, or even sound. From there we can begin to create networks of literary relationality.



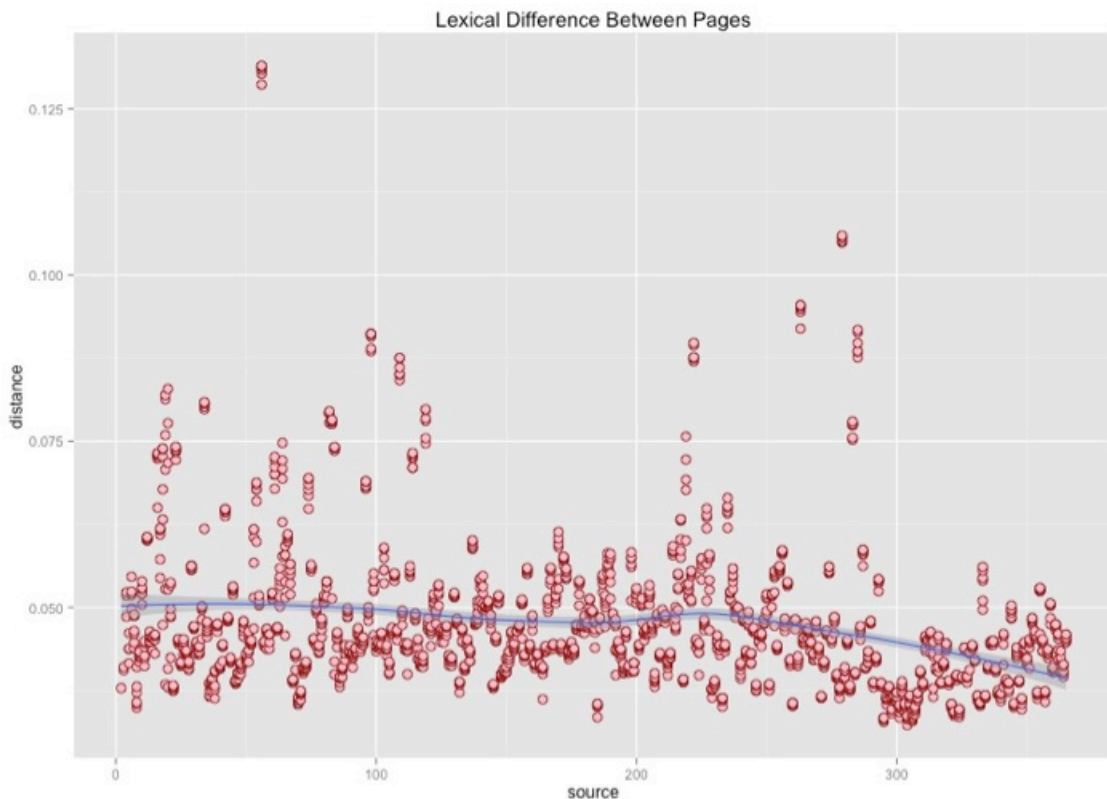
What you see here is an evolutionary graph of the pages of the first edition of Walt Whitman's *Leaves of Grass*. Each node of the network stands for a page of the work and the edges represent the similarity or dissimilarity between pages. As each page enters the system, the algorithm calculates the distance of that page to all of the existing pages and selects the top 6 most closely linked pages (6 because that is the logn of the number of pages of the longest edition). What I'm interested in exploring is how the evolving editions of the *Leaves of Grass* relate to one another in their internal structure, at the level

of the page. How do the Leaves of Grass here unfold and what kind of knowledge can be gained by representing them as webs instead of leaves, of moving from arboreal ends to textilic means.

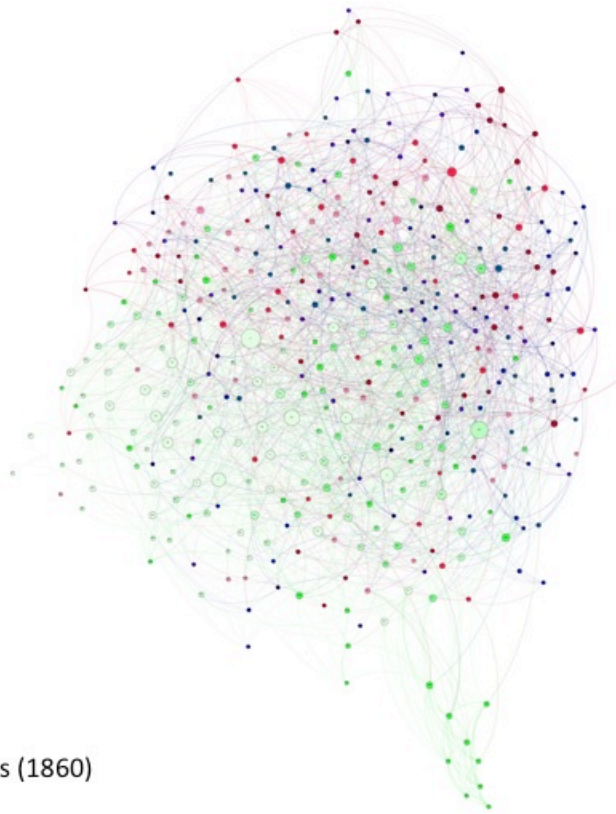
First I want to show you comparisons of the 1860 edition and the final 1891 edition (explain color-coding). The immediate differences are hard to envision, so I created a series of measures to try to better understand how each of the edition networks differ from each other. What you see here are a graphs of five different network measures that 1) include the average lexical distance between pages, 2) the overall diameter of the graph (the distance between the two furthest nodes), 3) the average page range between any two connected nodes in the network, 4) the robustness of each graph, which measures how many random nodes need to be removed before it breaks in half, i.e. how fragile it is, and finally 5) transitivity, which measures the number of closed loops or triangles in the graph as a percentage of all connections. The higher the number the more closed loops you have, the lower the number the more openness you have.



What is very interesting about these measures is the way they begin to tell a particular story about *The Leaves of Grass* as an evolving poetic entity. That story is, I would suggest, one of compaction and consolidation. Over time, *The Leaves of Grass* becomes less linguistically heterogeneous. It curls in on itself, as the pages begin to connect to pages closer themselves, as the lexical differences between connected pages decrease, as the overall range of the work shrinks, as the network gets more robust and thus tighter, and finally as the number of closed loops grows. There is a sense of closure to the poetic process of rewriting, which you can see in this graph that captures the lexical distance between connected pages in the network of the final edition. There is a downward trend of difference within the final work, as the work itself recapitulates this larger process of consensus and closure.



We can visualize this another way if we compare those 1860 and 1891 networks to each other. There is, if we toggle back and forth between them, something like a paginal arc evolving – where in the 1860 edition we have what appear to me to be discrete blocks or zones, in the 1891 edition as we move from the light green in the lower left, to the pinks in the upper left to the blues in the right and then the very darkest nodes, which are the final pages of the work, entering back into the heart of the graph, we could speak of the final edition of *The Leaves of Grass* as poetic spiral, incidentally the Ur-Symbol of all plant life for Whitman’s predecessor Johann Wolfgang von Goethe.



Leaves of Grass (1860)



Leaves of Grass (1891)

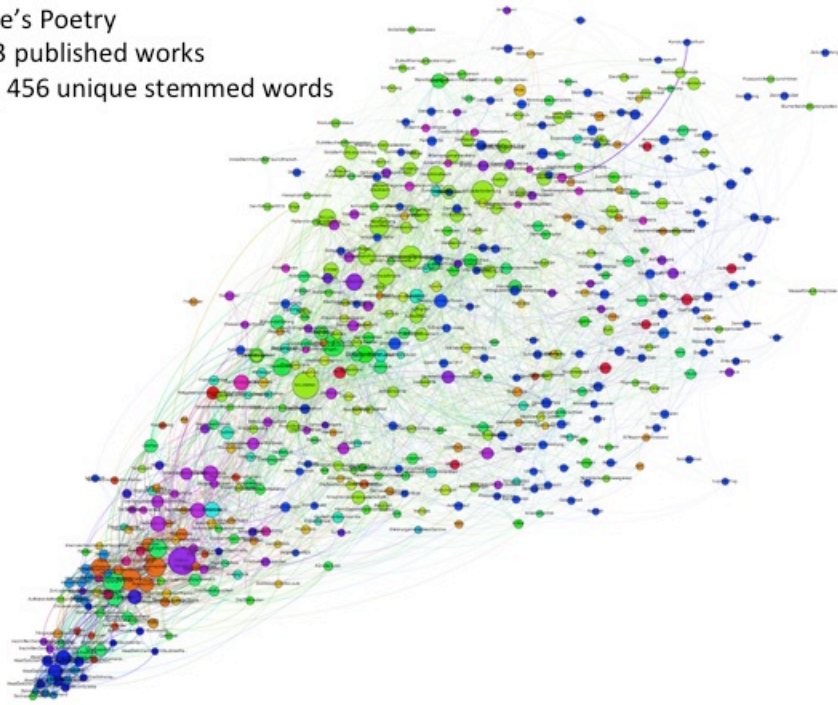
We can also see this kind of effect being corroborated at the level of language. One of the things I've been exploring as well is the introduction of new vocabulary for each edition. So where for the second edition we see words such as indeed, maybe, democracy, democratic, serve, globes, and eastern being introduced as the most frequent words that were not in the previous edition – the democratic ethos of *The Leaves*, the wavering emphaticness of poetic diction between indeed and maybe, and the spatial ambitions between globes and eastern – by the final edition we see a very different list: poetry, concluding, anything, emotional, mellowing, and suggestively, evolutionary. This is the language, quite literally, of a tentative conclusion, of an end of poetry and its possible futurity.

One of the things this project has made me think more about is the relationship between human aging and poetic expression, what we might call biopoetics. I'm interested in seeing how writers' work develops over time and whether there are consistencies between that development. Is there something common about the "career" or the "corpus" when taken as a whole or do we find that career's are more culturally conditioned, or more expressive of the writer's personal poetic aims? When I was in graduate school I was trained to studiously avoid biographical criticism, for reasons that are in retrospect not entirely clear to me. It's telling, in a sign of the times, that one of the greatest proponents of this doxa, Stephen Greenblatt, is finishing his career by writing biographies of poets. We know for example from the work of Ian Lancashire that large-scale linguistic patterns can indicate the onset of mental illness in writers. As he has shown, we can identify with a great deal of precision when alzheimer's emerges in writers, most often well before they are officially diagnosed. But aside from these more dramatic physiological states reflected in language, I'm interested in the extent to which there might be associations between how we write and how we age.

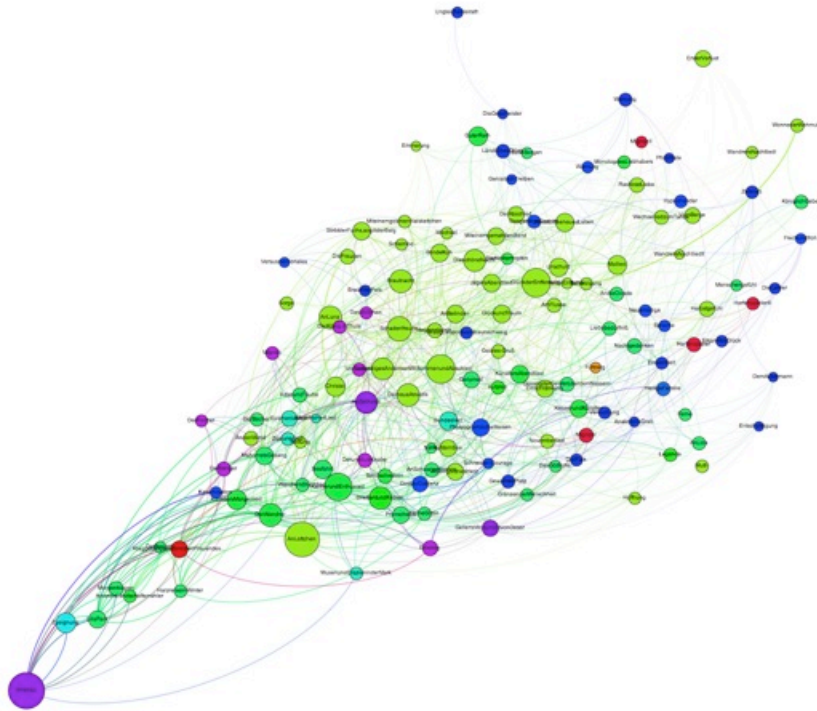
To that end, I want to share with you work I've been doing on the career of one of the writers I am most familiar with, J.W. Goethe. Here you see an evolutionary network of Goethe's poetry, color-coded by genre, which we break into the usual tripartite schema used to define his career of early, middle, and late. What I think you can see is the way by the final period we witness this extraordinary stylistic opening-up (the greater distances, the chromatic heterogeneity). The older writer does not increasingly repeat himself, as in the case of the mentally afflicted Agatha Christie, but instead experiment with an increasing number of genres and discourses.

Goethe's Poetry

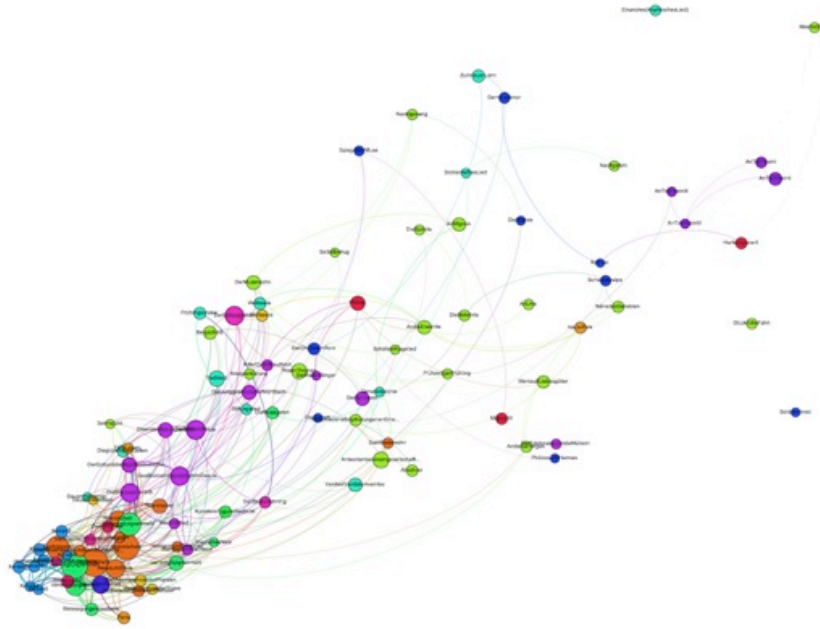
- 523 published works
- 12,456 unique stemmed words



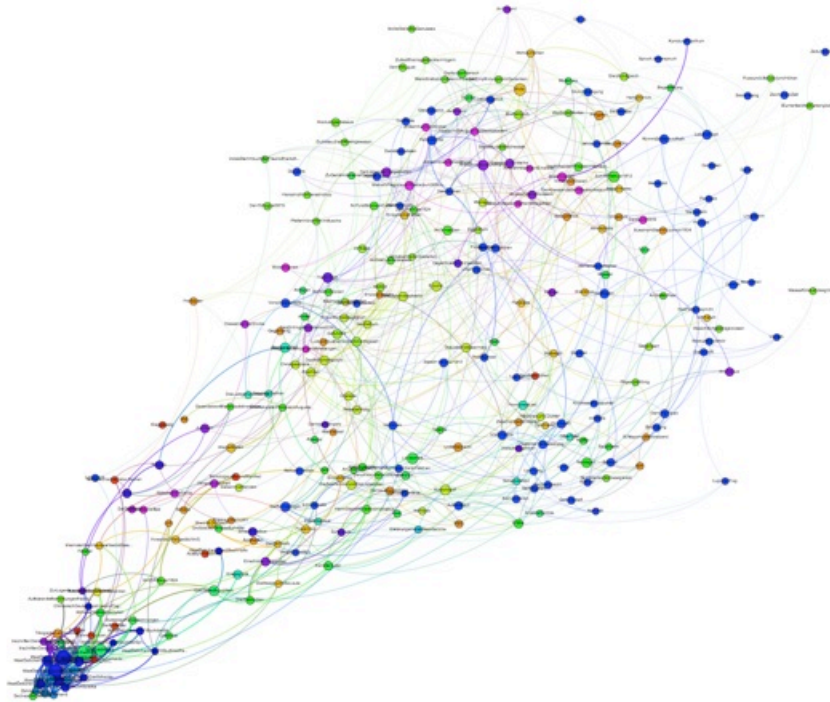
EARLY



MIDDLE



LATE



If we return to our network measures, I think we get a relatively clear picture: so for each period we have 1) the average lexical distance between works, 2) transitivity scores, 3) diameter of the network, and 4) entropy score, which calculates the generic diversity by period, so the more genres that are represented as a percentage of all possible genres the greater the entropy and thus the higher the number.

Network Period Measures

Avg. Distance	Diameter
[1] 0.06673064	[1] 0.697328
[2] 0.03505011	[2] 0.3347029
[3] 0.06267554	[3] 0.8430876
Stdev Distance	Entropy
[1] 0.02702668	[1] 0.1578025
[2] 0.02003975	[2] 0.1442209
[3] 0.03095045	[3] 0.4230700
Transitivity	
[1] 0.2036658	
[2] 0.2770749	
[3] 0.1999503	

The two salient points are the formal expansions of the late period – the generic entropy, the greater irregularity of distances between works, the increasing diameter – but also just how compact the so-called classical or middle period is. There is a tremendous formal consolidation that occurs during this phase of Goethe’s career that makes the late opening out all the more emphatic. The number of closed loops decrease by close to 30%, the variance of distances between works increases by 50%, the avg distance doubles, and the diameter is 2.5 times as wide. (It should be added that the avg. distance that matches the early period is very significant given the greater number of poems and thus the

greater linguistic horizon that the late poems can connect with. The similarity of distance given the overall greater availability of language suggests a profound commitment to diversity.)

So what you have are two different examples of how poet's imagined their careers – Whitman moving ever more in the direction of closure and compaction, Goethe moving in the direction of expansion, one spiraling out, the other in. I'm still working on incorporating other poets into the mix – data is hard to come by – but just to give you another example, for someone like Wordsworth what you find is a mid-career expansion followed by what appears to be a pretty strong gesture of compaction.

iv.

I want to conclude with some reflections on why this might be a good idea. What is the value of moving between quantitative and qualitative translations of texts? Should we be doing this and if so, why?

First, it should come as no surprise that I think this kind of work can make us and our students more critical agents within an increasingly networked environment. If we're all being data mined all the time, we want people with a sense of culture, nuance, conceptual creativity to be able to participate in those debates too. More specifically to the pursuit of the humanities in particular, studying language in this way allows us to better understand what we might call the vectoral qualities of language – the way language has instructional and not just semantic meaning, or to put it another way, to study what words do rather than what they say. It orients our attention not exclusively in terms of texts to be interpreted, but additionally in terms of environments to be

constructed. How do different types of language generate different types of textual environments or fields? We can reverse engineer these things to explore the effects that different features or vectors of language have on generating textual fields.

Second, translating between quantity and quality challenges the otherwise highly linear nature of our inherited models of critical reading. From Adorno to De Man to Said, “critique” always seems to involve a form of negation, a negation that implies a particular directionality. According to these models, we can ever only read forward (towards belief) or in reverse (towards critique, as in the much invoked phrase “reading against the grain”). Critical reading is understood in this model as a form of breaking down some totality or illusion. It undoes.

What interests me about these network models is the way they don’t aim to move us in a single critical direction. Instead, they try to take seriously this oscillation, or perhaps better, “incorporation” of the partial and the complete. In translating from letters into numbers and representing them as spatial entities, we are also simultaneously *constructing* a textual world, one that is always only ever a contingent representation: a map, not a tracing of the terrain, to borrow from the words of the French philosopher Gilles Deleuze. Topologies construct a world, but it is always only ever a construction. We can redraw the topology according to an almost infinite number of features and combinations, with every world contingent upon the logic used to construct it. We look doubly upon the topological diagram: first at its results and second at the conditions through which those results were generated. It is a highly self-reflexive medium, like those stars in Goethe’s sonnet. And it is this process of *contingent world-making*, the

intermittent reflectivity that was also at the heart of the sonnet, that in my view lends the topological diagram its critical force. As Deleuze writes:

Every diagram is intersocial and constantly evolving. It never functions in order to represent a persisting world but produces a new kind of reality, a new model of truth. It is neither the subject of history, nor does it survey history. It *makes* history by unmaking preceding realities and significations, constituting hundreds of points of emergence or creativity, unexpected conjunctions or improbable continuums. It doubles history with a sense of continual evolution.

Instead of moving us to a single, as well as singular, state of insight (or revelation or truth or de-masking), topology conjoins the twin acts of critique and belief, theory and action, with one another through the persistent translation of reading's textual artifacts.

In doing so, and this is my final point, topology reframes our affective relationship to the text, reading's "conversion" that we have inherited as one of the dominant ways of relating to texts at a profound personal level and whose origins can be found in Augustine's *Confessions*. Unlike the singularity and the completeness of Augustinian conversion, the conversions – or we might speak here of the translations – of topological modeling are framed as multiple, ongoing, contingent, and yet no less real (as Deleuze remarks, they produce "a new kind of reality"). Belief is reinscribed *within* critique, rather than conceived as its opposite. To use a different vocabulary, we could say that topology moves us from a paradigm of a reading's revolutions to one of its resolutions. Reading topologically is a matter of both scale and persistence – resolution in the double sense – a series of contingent commitments. There is a loss of attachment that I think reading topologically produces in comparison with book reading, a point that

has certainly been true in my own case and that is important to emphasize and reflect upon. Part of the nostalgia for books is no doubt tied to this lost sense of attachment that accompanies modes of bibliographic reading. But this loss of attachment, this affective deficit, is compensated for by a no less valuable, in my view, incorporation of critique and belief within one another, what Goethe wanted to call *Erstaunen* or astonishment, the ability to hold in suspension the finality of judgment, conviction, or closure – all those sentential things. It is in the end, the wish to be able to hold in abeyance a sense of reading's end.