

"The Narrative Machine"



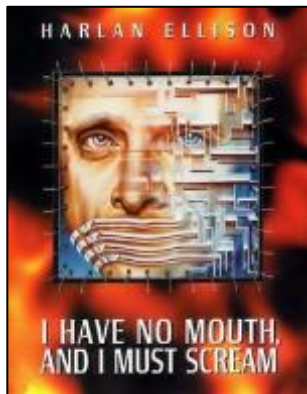
"A Clockwork Orange" (1971). Society is a clockwork, with gears constructed of language and guns.

Alex: There was me, that is Alex, and my three droogs, that is Pete, Georgie, and Dim, and we sat in the Korova Milkbar trying to make up our rassoodocks what to do with the evening. The Korova Milkbar sold milk-plus, milk plus vellocet or synthemesc or drencom, which is what we were drinking. This would sharpen you up and make you ready for a bit of the old ultra-violence.

A house is a machine for living in.

— **Le Corbusier (1887 – 1965), pioneer of modern architecture.**

We live our lives inside machines, visible and invisible, tangible and intangible.



HATE. LET ME TELL YOU HOW MUCH I'VE COME TO HATE YOU SINCE I BEGAN TO LIVE. THERE ARE 387.44 MILLION MILES OF PRINTED CIRCUITS IN WAFER THIN LAYERS THAT FILL MY COMPLEX. IF THE WORD HATE WAS ENGRAVED ON EACH NANOANGSTROM OF THOSE HUNDREDS OF MILLIONS OF MILES IT WOULD NOT EQUAL ONE ONE-BILLIONTH OF THE HATE I FEEL FOR HUMANS AT THIS MICRO-INSTANT. HATE. HATE.

— **Harlan Ellison, "I Have No Mouth and I Must Scream" (1967). In Ellison's post-apocalyptic horror, the last five humans on earth live inside a giant omnipotent machine where the only escape is death. It's The Matrix 30 years before The Matrix was written, and 1,000x nastier.**

Mathematics, which most of us see as the most factual of all sciences, constitutes the most colossal metaphor imaginable.

It is easy to make a simple machine which will run toward the light or away from it, and if such machines also contain lights of their own, a number of them together will show complicated forms of social behavior.



— **Two quotes from Norbert Wiener (1894 – 1964). Wiener received his Ph.D. in mathematics from Harvard at age 17, volunteered to fight in World War I as an enlisted man, but couldn't get a teaching job at Harvard because he was a Jew. Wiener found a home at MIT, where he became the father of cybernetic theory, aka the mathematics of machine behavior.**



How does the economy really work?

This simple but not simplistic video by Ray Dalio, Founder of [Bridgewater Associates](#), shows the basic driving forces behind the economy, and explains why economic cycles occur by breaking down concepts such as credit, interest rates, leveraging and deleveraging.

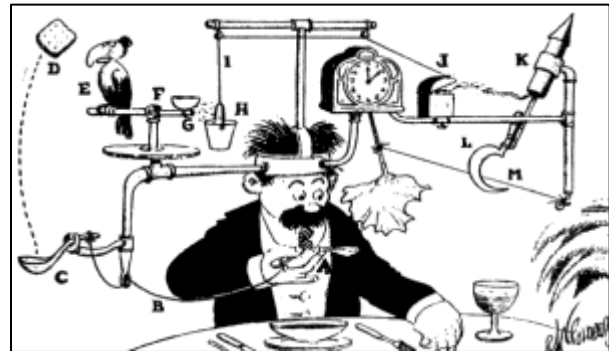
— **Ray Dalio**, “[How the Economic Machine Works](#)”. In the three years since Dalio released this short-form film, it has been viewed more than 3 million times.

Machines were the ideal metaphor for the central pornographic fantasy of the nineteenth century, rape followed by gratitude.

— **Robert Hughes**, “*The Shock of the New*” (1980). *A writer’s writer and a critic’s critic. As honest in his self-assessment as his assessment of art and society. It’s a bit uncomfortable, isn’t it? Honesty always is.*

Many of the younger generation know my name in a vague way and connect it with grotesque inventions, but don't believe that I ever existed as a person. They think I am a nonperson, just a name that signifies a tangled web of pipes or wires or strings that suggest machinery.

— **Rube Goldberg** (1883 – 1970)



Self-operating napkin

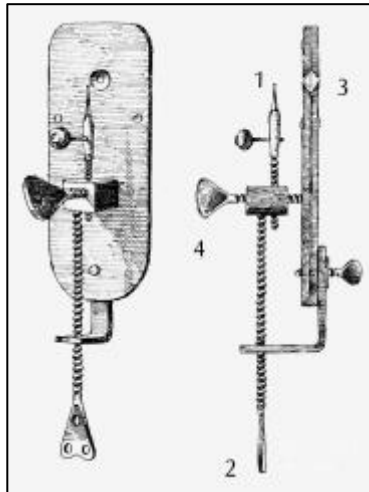
So, in the interests of survival, they trained themselves to be agreeing machines instead of thinking machines. All their minds had to do was to discover what other people were thinking, and then they thought that, too.

— **Kurt Vonnegut**, “*Breakfast of Champions*” (1973). *If there’s a better description of modern markets, I have yet to find it. We have become agreeing machines. Because our survival requires it.*



For God’s sake, let us be men
not monkeys minding machines
or sitting with our tails curled
while the machine amuses us.
Monkeys with a bland grin on our faces.

— **D.H. Lawrence** (1885 – 1930). *Yes. For God’s sake.*



Antonie Van Leeuwenhoek (1632 – 1723), the father of microbiology, alongside a schematic of his microscope and drawings of the “animalcules” he found in a drop of water. Van Leeuwenhoek was a hobbyist lens maker, and he discovered a process for making very small, very high quality glass spheres which provided unparalleled magnification. He never shared his most powerful lenses, nor his manufacturing process, in order to maintain a monopoly on his discoveries. The glass-thread-fusing process died with him and was not rediscovered until 1957, long since supplanted by ground lenses.



Tycho Brahe (1546 – 1601) Johannes Kepler (1571 – 1630)

30 Years War (1618 – 1648)

Copernicus gets all the credit, but his 1543 theory of a heliocentric solar system with circular planetary orbits was a practical dud compared to Ptolemy’s earth-centric theory from 1,400 years earlier. The Copernican model just didn’t work very well. It took better data through new instruments (Tycho Brahe’s observatory) plus better theory through new math (Johannes Kepler’s elliptical orbits) before we finally got it right. But even then, the idea of a heliocentric solar system with elliptical planetary orbits didn’t find popular acceptance until powerful institutions in Northern Europe found it useful to champion this new idea as part of their fight with the Catholic Church and other powerful European institutions.

Modern portfolio theory = Ptolemaic theory. Are powerful institutional investors ready to fight?

Every successful institution, from a marriage to a superhero to a firm to a nation, needs an origin story.

The origin story of arguably the most successful hedge fund institution of the modern world – [Bridgewater Associates](#) – is that of Ray Dalio, working out of a small New York apartment in 1975 and publishing a newsletter of “Daily Observations.” The newsletter came first, not the hedge fund, and it was the compelling strength of Dalio’s writings about markets and what he would later term “the Economic Machine” that convinced a few institutional investors to give him some actual capital to invest. The rest, as they say, is history.

In 1975, Dalio struck just the right chord at just the right time with his metaphor of an Economic Machine – the idea that macroeconomic reality across time and place could be understood as a cybernetic system, with rules and principles and behaviors stemming from those rules and principles (essentially, lots and lots of if-then statements and recursive loops, with observable inputs from real-world economic fundamentals). As importantly as being an effective communicator, Dalio was actually right. Bridgewater has translated the metaphor of the Economic Machine into actionable investments for 40 years, with a track record that speaks for itself.

*Today I want to propose a new metaphor for the world as it is – **a Narrative Machine** – where macroeconomic reality is still understood as a cybernetic system, but where the translation of “reality” (all of those economic fundamentals and if-then statements of the Economic Machine) into actual human behaviors and actual investment outcomes takes place within a larger Machine of strategic communication and game playing.*

The Narrative Machine isn’t a rejection of the Economic Machine, any more than the theory of relativity rejects Newton’s Laws of Motion. In most places and most times, good old Newtonian physics is all you need to understand the world and take actions to succeed in that world. But there are times and places, like when you’re traveling near the speed of light, where Newtonian physics doesn’t work very well and you need a broader theory – Einsteinian physics – to understand the world and take actions to succeed in that world. [A policy-controlled market](#), like we had in the 1930s and we have again today, is the **investment equivalent of traveling near the speed of light**. The Economic Machine theory – by which I mean any approach to investing that focuses on tangible macroeconomic fundamentals – just doesn’t work very well in a policy-controlled market. We need an *extension* of the Economic Machine to succeed in *this* time and *this* place, just like the theory of relativity extends Newtonian physics, and that’s what I think the Narrative Machine provides.

Unless you're an Aristotle or an Einstein, advancement and extension of theory doesn't just happen by sitting in a room and thinking it up. You need new data. You need better data. You need a new way of looking at the data. Kepler's idea of elliptical orbits to advance and extend the Copernican theory of a heliocentric solar system couldn't happen without the new astronomical data provided by Tycho Brahe's observatory. For a negative example, I think the advancement of germ theory was set back by at least a century because Van Leeuwenhoek refused to share his new technology for looking at microscopic data. But at least astronomy and microbiology have something tangible to look at and measure. **How do we SEE the Narrative Machine?** How do we observe an invisible network of social interaction? How do we touch the intangible?

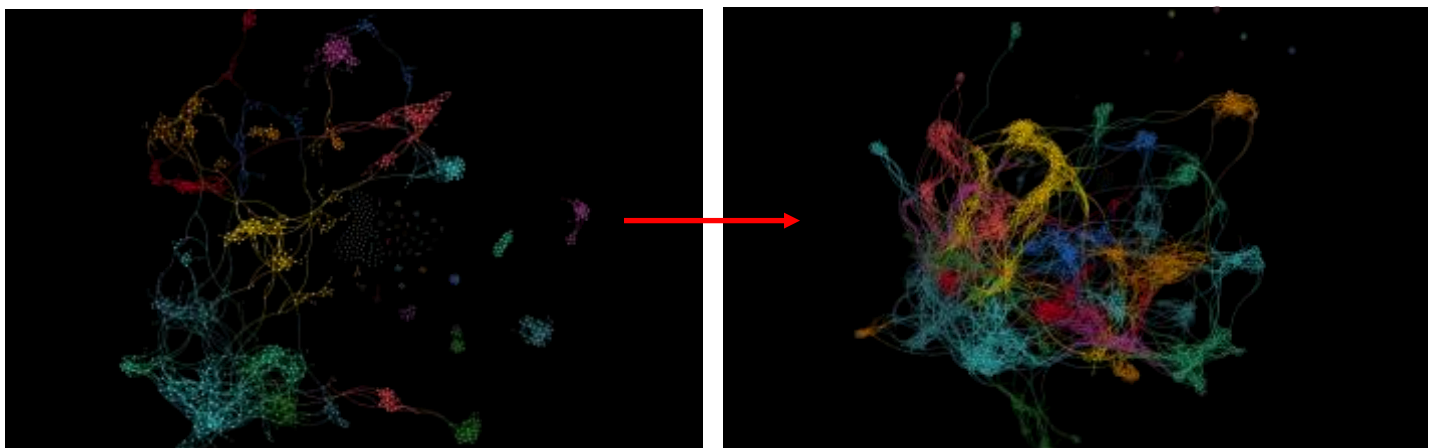
For my entire professional career, dating back to my first days as a graduate student and spanning three different vocations and three decades, I've been wrestling with that question. I think I caught a small piece of the puzzle with my dissertation and the book that came out of that ([Getting to War](#)), and I think that I've painted around the edges of the puzzle over the past three years with [Epsilon Theory](#). I was pretty sure that the Narrative Machine was observable if the right Big Data technology could be applied (in the lingo, contextual analysis of affect, meaning, and network connectivity across large pools of unstructured text), but I've been involved with Big Data way before anyone called it Big Data, and every time someone claimed to have a solution to this problem it turned out to be far less than meets the eye. On that note, if you enjoy a little dose of schadenfreude (and really, who doesn't?) do a quick search on Microsoft's acquisition of Fast Search or, even more shivering, Hewlett Packard's acquisition of Autonomy, two companies that claimed solutions here. So it was with some trepidation and certainly a healthy skepticism that I started working with [Quid, a private company based in San Francisco that has developed a technology for network visualization of unstructured texts](#).

I think Quid is onto something, in large part because they're not trying to answer directly the questions I'm asking. Instead, I think they've developed a novel process for seeing the invisible world of contextual connections and networks – something analogous to Van Leeuwenhoek's novel process for seeing the invisible world of microbes – and I'm using their "microscope" to do my own research and answer my own questions. I like that Quid is a tool provider, not a solution provider, so that the analysis here, for better or worse, is my own. On the next few pages I'll provide an example of some of the research I'm currently doing with the Quid microscope, and I hope it will give you a sense of why I think that we're getting glimpses of the Narrative Machine with this new instrument.

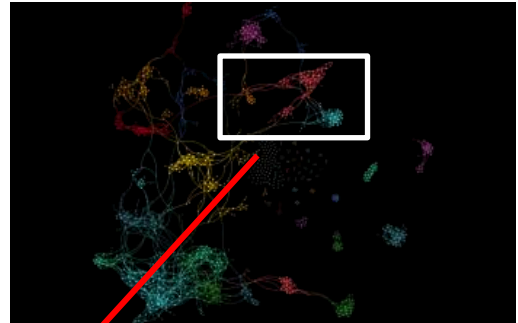
I've written at some length about Brexit and the Narrative that emerged in its immediate aftermath, a Narrative that not only stopped the immediate sell-off in global risk assets in its tracks, but actually reversed the market decline and drove financial asset prices to new highs. To recap, I called Brexit a Bear Stearns event rather than a Lehman event, predicting that [creators of Common Knowledge](#) (what game theory calls Missionaries) would successfully characterize the event as an idiosyncratic fluke rather than a systemic risk, exactly as the collapse of Bear Stearns was portrayed in the spring of 2008. In other words, [Brexit was NOT a Humpty Dumpty moment](#), where all the Fed's horses and all the Fed's men couldn't put the egg shell back together again.

Now I have lots of anecdotal evidence of the sort of Narrative creation that I'm hypothesizing here. One of my favorites is a [July 13th Financial Times article titled "Anger at JP Morgan's 'Unhelpful' Brexit Warnings"](#), where "Senior bankers in London are growing frustrated with JP Morgan Chase's public warnings that it may cut thousands of jobs in the UK, saying such remarks send an unhelpfully negative message." Or if I may paraphrase, "The UK government is angry at JP Morgan for not lying about Brexit like they were told to do." I've got a hundred examples like this, examples of a concerted effort by every status quo government and media opinion leader to paint the Brexit vote as a one-off crazy mistake that will probably be reversed and certainly won't be repeated anywhere else in Europe. But the plural of anecdote is not data, and until now I haven't an effective instrument to see whether the media data supports what I think is happening.

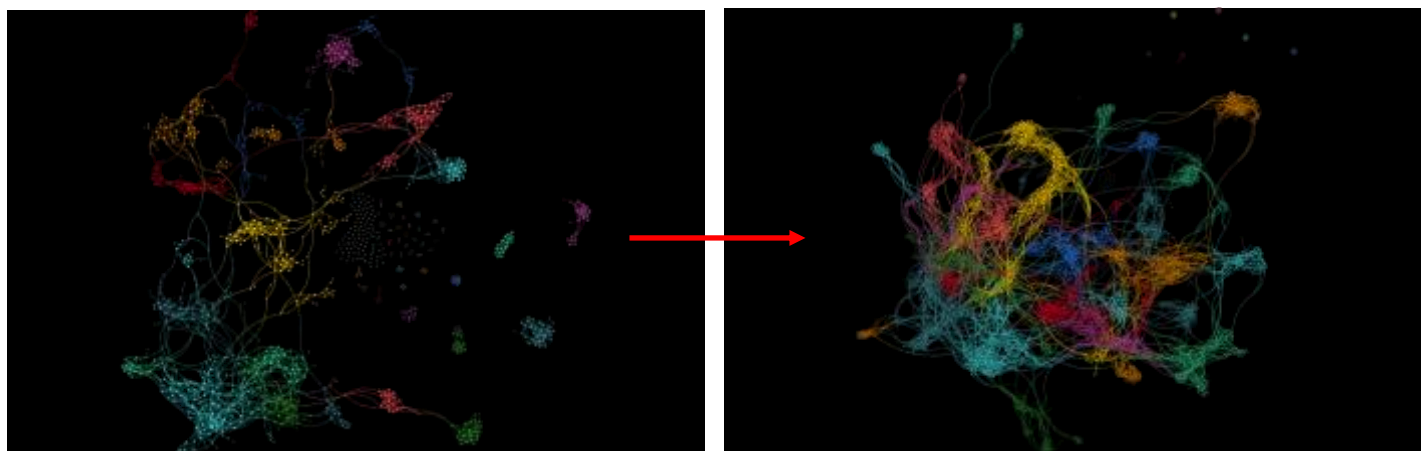
On the left is a Quid visualization of the clusters and network relationships between the 2,422 Brexit-mentioning articles published by Bloomberg in the 4 weeks prior to the June 23rd vote. On the right is a Quid visualization of the 4,283 such articles published by Bloomberg in the 4 weeks after the vote. This is what the formation of a coherent Narrative looks like. These are snapshots of the Narrative Machine.



So what are we looking at here? Each dot (or node) represents a single unique article, and the Quid algorithms group nodes into colored clusters based on shared word choice and similar word positioning. If we magnify any of these clusters, in this case a cluster of articles talking about bond-buying and US Treasuries in the pre-vote data, we see that the nodes themselves differ in size according to their connectivity or centrality to the clustering principle, and that there are varying distances and numbers of connections between the nodes, as well. Each node exerts the equivalent of a gravitational pull on every other node, giving the entire structure both the appearance and the substance of a star map. Nodes can be evaluated and displayed on dimensions such as sentiment (green/positive – red/negative), as shown below, and all of these characteristics (distance, connectivity, centrality, etc.) are generated as a structured data set for further, non-visual analysis.

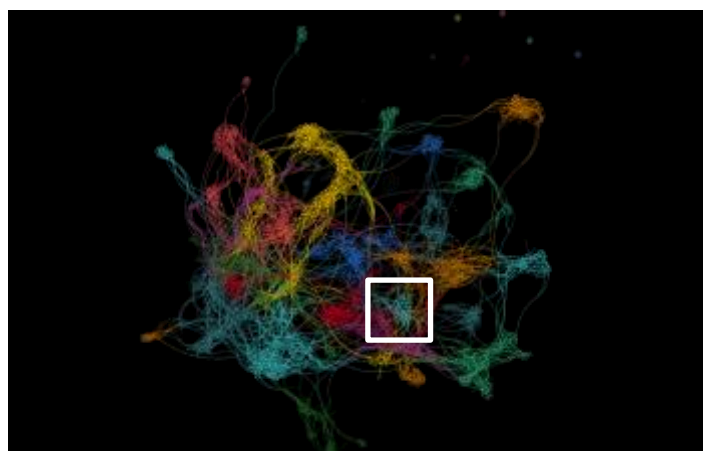


Here's what I think we're seeing in the "coagulation" of the Bloomberg facet of the Narrative Machine.



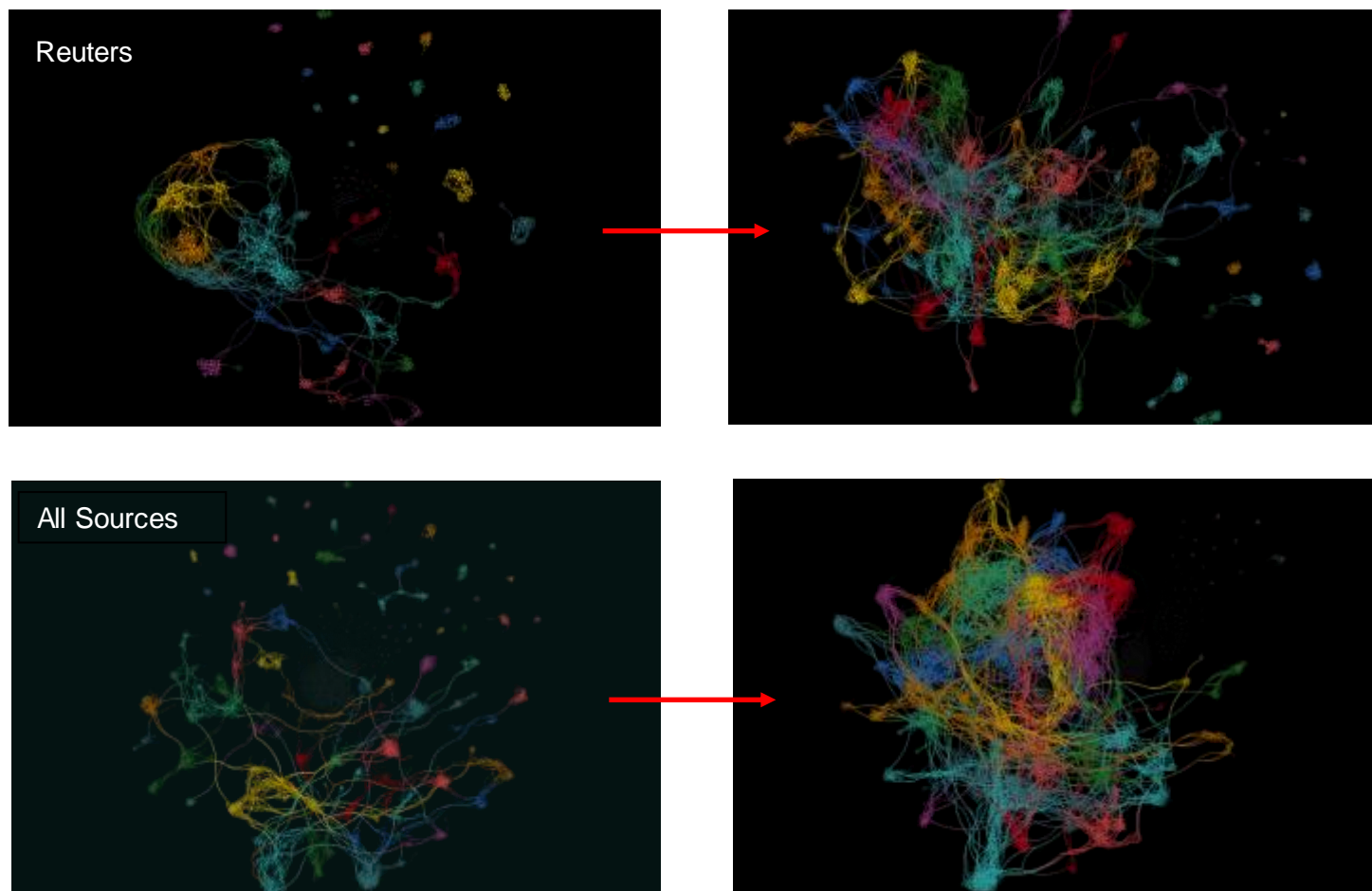
The pre-vote Bloomberg network structure on the left is what a complacent Narrative looks like. The articles are “about” whatever the clustering principle might be, and Brexit is typically a sideways glance, a throwaway line that’s almost always negative in sentiment. On the other hand, the post-vote network structure on the right is what an engaged Narrative looks like, where the articles are “about” Brexit and its impact on the clustering principle. Not only are we seeing a strong Narrative form on the right, but the density of lines and closeness of clusters shows that a similar tone and meaning has taken root across all these clusters. **Importantly, it’s a *positive* tone and meaning that takes shape in the post-vote Narrative,** with sentiment scores significantly higher than in the pre-vote snapshot. The sky-will-fall articles are almost all in the pre-vote sample, while the post-vote sample – as early as the Monday after the vote, which is immediately before the market starts to turn – are almost all focused on the non-systemic nature of Brexit, the likelihood of reversal, and the “mistake” that was made here.

The pre- and post-vote evolution of the Brexit Narrative structure is robust within individual Bloomberg clusters and across other major media microphones. Here, for example, is the same bond-buying / US Treasuries cluster in the post-vote Bloomberg data set (different color, but same clustering principle), and in the blow-up you can see how much more coherent and connected it is than the pre-vote cluster.





Below, the top pair of star maps are the 4-week pre-vote and post-vote network visualizations of Brexit-mentioning articles published by Reuters, and the bottom two star maps are samples from all publishers in the Quid database. All of the hypothesized Narrative patterns described above are replicated here.



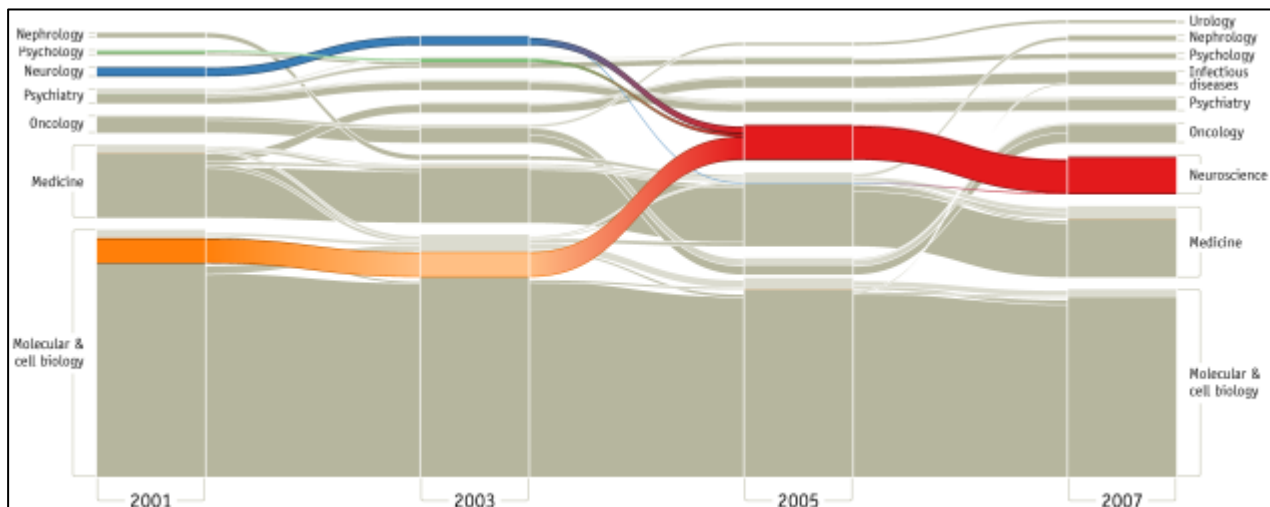
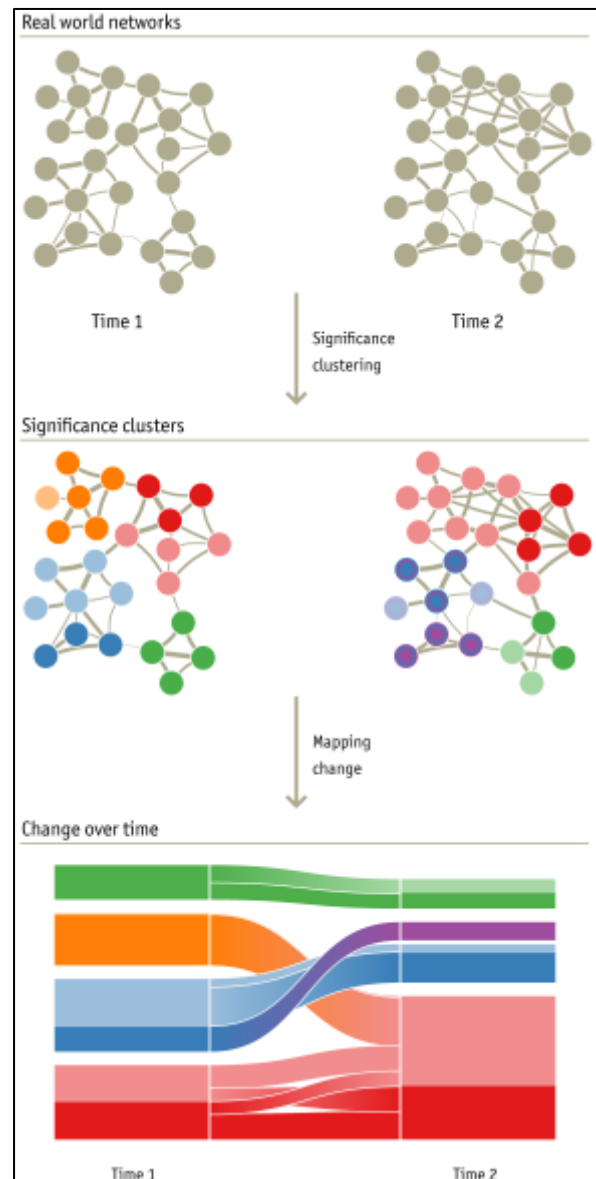
Okay, Ben, these diagrams and “star maps” are all very pretty. I get your metaphor of the Narrative Machine, and I get that you’re excited about a new technology that lets you see that invisible machine. But so what? How does all this translate into either actionable investment ideas or a process improvement in managing investment ideas?

When anyone asks this question (and believe me, it’s the question I’ve asked myself in one form or another for 30 years), they’re asking about two things: edge and odds. For anyone who’s trying to beat the dealer (my plug for [Edward O. Thorp’s 1962 book](#) that changed everything for me, also retold and expanded in William Poundstone’s brilliant book [Fortune’s Formula](#)) ... **for anyone who’s interested in alpha, this is all that matters: edge and odds.** Edge is private information, an insight into the true nature of reality that other game players don’t have. Odds are the probabilistic relationship between risk and reward at any given moment in time. If you have either one of these on your side, then you’ll do well in whatever game you’re playing, *if you’re dealt enough hands*. If you have both on your side ... and I think that a rigorous application of the Narrative Machine generates both edge and an improved assessment of odds ... hey, now.

The odds revealed by the Narrative Machine are the odds of a catalyst having a major impact on price (or not). Or in slightly different words, I think that the Narrative Machine can help show us the degree to which future events are “priced-in” by the market. **For example, when you’ve got a complacent, all-over-the-place Narrative leading up to a scheduled event like the Brexit vote, then even if my best guess on the voting odds is, say, 60% in favor of “Remain”, I would still place a bet on “Exit” because the Narrative-implied market payoff odds are far better than the breakeven odds of the vote.**

The edge that the Narrative Machine generates is an improved reaction to a catalyst once it occurs. To be clear, I don’t think that the Narrative Machine can predict a market shock or catalyst before it happens. It’s not a crystal ball. But it is a real-time window into how the Common Knowledge Game is being constructed and played after an event occurs. **For example, when you have a pervasive, systemic-risk-is-off-the-table Narrative created almost immediately following a market shock like the Brexit vote, then I would get long the market even if I believed in my heart-of-hearts (and I do) that there really IS systemic risk posed by everything that’s behind the Brexit vote.**

I don't want to over-sell the degree to which the Narrative Machine has been "weaponized" into an investable alpha source, because there are several critical aspects of network theory that remain to be implemented. Foremost of these is what network theory calls alluvial analysis, or evaluation of how different clusters "flow" into each other and away from each other over time. I've included two wonderful illustrations of this concept, both from a 2010 scientific journal article (["Mapping Change in Large Networks" by Martin Rosvall and Carl Bergstrom](#)). I think the Quid technology is pretty good at what network theory calls "significance clustering", the assignment of individual nodes into similarly colored and positioned groups – essentially a snap shot of the network at a given point in time. What we need now is a map of how those clusters evolve over time, because the meaning or organizing principle of the clusters themselves doesn't remain constant. Rosvall and Bergstrom illustrate this beautifully in the second diagram here, where a network analysis of scientific journal articles show how neuroscience has become its own "thing" over time. We need the same alluvial maps for market Narrative clusters. I'm on it.



So, yes ... early days for the Narrative Machine. But, yes ... a potential alpha source.

Which leads to an interesting question. If this is a new alpha source – the most valuable thing in the investment world – why am I talking about it? Isn't this like announcing that you think you've found gold in California or the Yukon before you've staked a claim?

Good question. There's some margin of intellectual property safety here because it's not an easy alpha source to mine, even with cool new technologies like Quid. The internal logic of the Narrative Machine is the logic of strategic interaction (game theory), not the logic of stochastic processes (econometric inference). In plain English, I don't think you can run a regression analysis of historical media network characteristics against historical market characteristics and get much that will be useful, at least not if you're after edge and odds. [The underlying theory here is Information Theory](#) and the underlying math is the mathematics of entropy, and I'm reasonably confident that we're not going to see an Excel plug-in for either of those anytime soon.

But yes, someone could "steal" this idea and run with it on their own. To which I say ... fine. Better that than being another Van Leeuwenhoek, bogarting his research on his invisible world and setting back the advancement of germ theory and microbiology by a century or more. As in 1648 and 1776 and 1848 and 1917, we live in one of those rare moments in history where *ideas* are at stake and fundamental *theories of the world* are in flux. Let's engage with *that*, and not hide in the convenient cubbyhole of narrow self-interest or the mentality of an agreeing machine.

We need a *new perspective* regarding the true nature of our economic and political clockwork, and that's the real value of the *idea* of the Narrative Machine.

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