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Toward a Generative Model of Legend: Pizzas, Bridges, Vaccines, and Witches

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Abstract: We propose a generative model of the legend. The model is elaborated based on two case studies, the first of contemporary storytelling related to vaccination on parenting blogs, and the second of historical storytelling related to witchcraft and folk healing in nineteenth century Denmark. The model reveals the interdependent levels of the multiscale model, solving a problem of poor fit related to many two level models of folklore genre structure. The model supports the study of rumor, and the dynamics of storytelling, including the hyperactive transmission state of "viral" stories.

1. Introduction

The oxymoron "fake news" is now part of popular parlance. Used pejoratively on the one hand by Donald Trump and his extremist acolytes in their attempts to discredit the free press, and descriptively on the other hand by journalists and other pundits to describe the deliberate circulation of hoaxes masquerading as legitimate journalism, the phrase acknowledges the prospect that reported news might not be an unbiased recounting of actual events, but rather an ideologically biased retelling of events, real or not. In folkloristic terms, "fake news" is closely aligned with rumor and legend. While it is generally accepted that the press focuses on informed reporting of things that have actually happened and that can be independently verified, storytelling in everyday life, which now includes social media and websites disguised as news sources, is not constrained by any such goals.

In 2016, the Oxford English Dictionary named "post-truth" the word of the year, signaling both the rise of the legend as a challenge to established news sources, and the ascendance of "believable" as opposed to "verifiable" as a standard for reportability (OED 2016). Already in 2005, Stephen Colbert, in his Comedy Central television show, coined the term "truthiness" to describe the slippage that occurs in ideologically framed narratives, where the teller's motivations for telling are not rooted in a quest for truth, but rather in a quest to convince or to mislead (Zimmer 2005). An intriguing illustration of this slippage occurred in the run up to the 2016 U.S. presidential election with two scandals that were front and center in the American news, social media, and across the internet. The first, "Bridgegate", was based on verifiable events related to the closure of several lanes leading to the George Washington bridge in Ft. Lee, New Jersey that caused traffic chaos for five days in September 2013. The second, "Pizzagate", was based entirely on an ideologically-driven fiction that was presented through a series of stories told as true, in which high ranking members of the Democratic establishment were alleged to be involved in a child-sex ring operating out of the basement of a Washington DC pizza parlor. In both cases—albeit for different reasons—access to information detailing the underlying events was

limited. Confronted by this maelstrom of imperfect information, people told stories to make meaning from the events, irrespective of whether those events had happened.[1]

Interest and engagement in both of these narratives can be measured, albeit quite coarsely, by metrics provided by search engine companies. The search history for Bridgegate, as modeled by GoogleTrends, reveals a spike in late October and early November 2016 during the trial of the co-conspirators in what was eventually revealed to be a political payback operation. When the machinations of the conspiracy were discovered to go all the way to New Jersey Governor Chris Christie's inner circle of advisors, his political ambitions were torpedoed and the events were fitted into the broader domain of corruption and pettiness in American politics. Immediately after the trial, attention turned sharply to the Byzantine "Pizzagate" conspiracy (Figure 1). Here, the hacked emails of the Democratic National Committee were the basis for the creation of a narrative framework alleging that John Podesta, chairman of Hillary Clinton's presidential campaign, was the lynchpin in a child-sex ring run by Democratic party operatives out of the basement of Cosmic Ping Pong, a pizza parlor in the extreme north-west district of the city. The fiction spilled over into real world action in early December 2016, when a heavily armed 28-year-old North Carolina man, Edgar Welch, arrived at the restaurant intending to verify the stories he had encountered online (and no doubt heard in informal conversations), and liberate the imprisoned children.[2] During his "investigation" he shot three times inside the restaurant but, after discovering neither imprisoned children nor a basement, he surrendered to police.[3]

Figure 1. Search trends for "Bridgegate" (blue) and "Pizzagate" (red) for a 4-year period, beginning in August 2013 (prior to the events of Bridgegate), as modeled on GoogleTrends. The lines of the graph cross during the week of the presidential election in 2016.

2. Toward a Generative Model: Structure-Narrative Framework-Story

These two cases reveal fundamental aspects of the emergence and circulation of legends.[4] Stories are told and circulate on and across social networks, where they are reshaped and retold (Fine 1979). Every story performance, be it in whole or in part, offers information about a knowledge domain. Through the repeated telling of stories, a narrative framework, which comprises a relatively stable group of actants (people, places, objects) drawn from a culturally determined pool of potential actants and relationships for that domain, emerges. Subsequent stories are based on that framework, either as

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1　In Bridgegate, the information about the events was hard to come by as it was being deliberately covered up while, in Pizzagate, there were no events, the scandal based entirely on fiction. Nevertheless Pizzagate stories relied on this concept of cover-up to support the narrative and explain why information was hard to come by. The relationship between rumor spread and imperfect information is considered by Nekovee et al. (2007).

2　This spillover from narrative into real world action is fundamentally different than the ostension described by Dégh and Vázsonyi (1983) and expanded on by Ellis (1989). Here, a person takes action based on the story, whereas in ostension, presentation supplants representation—a person acts part of the story.

3　The discussion of the police's response resulting in the surrender (as opposed to shooting) of the white shooter is beyond the scope of this paper.

4　I use "story" to refer to individual tellings of legends, whether complete or in part. In the model presented here, "story" is an activation of the "narrative framework" that follows the "legend" structure.

wholly realized activations of the entire framework or, as is more often the case, partial activations of that framework. The narrative-story relationship is a mutually constitutive feedback loop: the narrative provides a generative framework for stories, while stories influence the parameters of the underlying framework. Since Bridgegate was based on actual events, the narrative was messy and never coalesced into a clearly defined narrative framework, ultimately being supplanted by the complex stories of journalistic reporting, and disappearing from most informal storytelling. By way of contrast, since Pizzagate was fiction, the storytelling converged rapidly on a stable narrative framework of political cover-up, with American children threatened by the sexually perverse agents of the Democratic party. In the following pages, a multiscale generative model of legend is explained in greater detail, and both historical and contemporary examples illustrate how it functions.

The structural study of legend, as with most structural studies of genre, has been largely predicated on a two-level model of the relationship between deep structure and the realization of that structure in story. In folkloristics, these models can be traced back to Vladimir Propp and his discussion of *syuzhet* and *fabula* (Propp [1982] 1968). Structuralism has had an understandably broad appeal, particularly since structural models can be formalized and applied consistently across many tradition groups and domains (Dundes 1964; Holbek 1987; Foley 1991; Seljamaa 2008; Finlayson 2016). Despite these successes, it has also been subject to repeated criticism, given the seemingly inflexible constraints that models impose on what fieldwork has shown to be otherwise quite fluid. The models have generally failed to account for the real-world phenomenon of abbreviated storytelling and story commentary, a common feature of legend telling, and have difficulty accommodating the broader features of tradition such as genre crossover, and domain intersection and interdependence (Dégh 2001).

A modification of the standard two-level structural model is proposed below, with a specific focus on the legend. Inspired by Roland Barthes (1966) discussions of narrative structure, the model consists of three scales: a macroscale, a mesoscale, and a microscale. The macroscale recognizes the formal constraints imposed by tradition on genres, the mesoscale details the negotiated constraints that groups impose on storytelling within a domain, and the microscale focuses on stories as they emerge in performance (Figure 2). In this multiscale model, the macroscale (tradition context/structure) and the mesoscale (domain/narrative framework) are largely inferred. In contrast, the microscale of story/performance context is both observable and recordable.
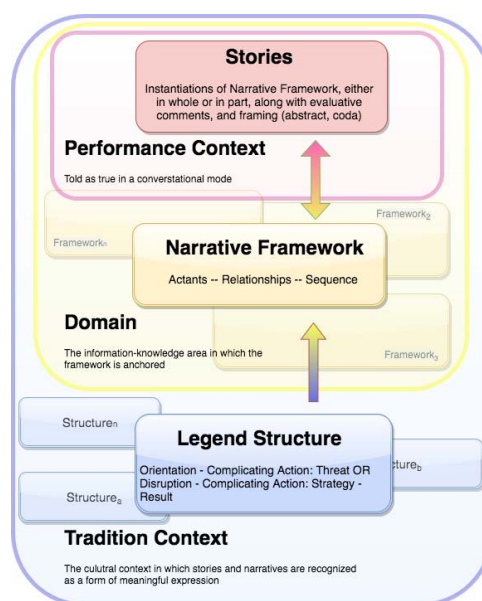
Figure 2. A simple generative model of legend, showing the relationship between structure, narrative framework, and story, as well as the relationship between tradition, domain and performance context. The blue represents macroscale, yellow mesoscale, and red microscale phenomena.

3. Macroscale: Tradition Context and Structure

The macroscale is predicated on the notion that there are a range of expressive forms that members of a tradition group share and that they, either consciously or unconsciously, want to have persist (i.e., tradition). Any tradition context will include multiple, at times overlapping, expressive genres, each characterized by a relatively stable formal structure. The range of genres operative in a given tradition and their attendant structures can be derived from the observed expressive culture of that group. In the examples presented here, legend is recognized as a genre within the culture of the various target groups considered, but is only one among many other genres of meaning making expressive forms that the group recognizes. The structure of legend is embedded in this tradition context: members of the tradition group, through their enculturation in that group, have learned the structure of the legend, and model their own believable storytelling, through the intermediary narrative framework, on this structure.

Wilhelm Nicolaisen (1987) provides the best known structural model of the legend, basing it on one developed by William Labov and Joshua Waletzky for narratives of personal experience (Labov and Waletzky 1967). He modifies that structure to account for observed aspects of legends in a collection of contemporary legends, concluding that legend structure is comprised of three necessary and three optional elements: [Abstract], Orientation, Complicating Action, Result, [Evaluation], and [Coda] (Nicolaisen 1987, p. 72).[5] Each of these elements serves a particular function in the narrative.

The orientation establishes the legend's community of focus and, given the close relationship between the tradition participants' external reality, and the story's internal reality, establishes the conceptual boundaries of the community. The establishment of the "inside" in the orientation can be quite abbreviated, and storytellers often use a shorthand, leveraging the shared aspects of the tradition context in which the story is told. In these cases, the participants can assume that they have a shared conception of inside (or through repeated tellings come to have a shared conception of inside). This inside community is then either threatened or disrupted by the complicating action.

One of the most under theorized aspects of the Nicolaisen model is the complicating action: the "what happens" that makes the story reportable in the first place (Robinson 1981). In legend, the complicating action requires a disruption or threat to the inside community. Threats can largely be categorized as threats to the physical, spiritual, social, political, or economic well-being of the inside community, or any combination of those, while disruptions can be construed as anything that upsets the status quo of the inside community. In turn, the threat or disruption requires some sort of counter action—a strategy to deal with the threat or to restore order. Here, even inaction is a form of action. Michel de Certeau, in his study of everyday life, characterizes stories as "repertoires of schemas of action" (de Certeau 1984, p. 23), implicitly recognizing that stories model how one might react to various events and the range of potential outcomes of those reactions. In the modification of the structural scheme proposed here, the complicating action is broken into two parts:

1. Complicating Action: Threat/Disruption
2. Complicating Action: Strategy

This particularization of the complicating action into two parts provides a necessary degree of detail that is glossed over in other models. It allows one to identify, in the first part of the complicating action, the broad range of threat agents that are recognized in the tradition group for a particular domain—in other words it identifies the range of potential "outside" groups that stand in contradistinction to the "inside" of the orientation, and identifies the types of threats or disruptions that the inside group considers reportable.

The second part of the complicating action, strategy, allows tradition participants to explore the range of possible responses to the particular threat or disruption. Again, the tradition context

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5   Square brackets indicate an optional element.

provides a deep pool of potential responses limited by the domain, reflecting Albert Eskeröd's concept of tradition dominants (Eskeröd 1947). In essence, the strategy answers a generic version of the Ghostbusters question, "When ghosts appear in the neighborhood, who ya' gonna call?" (Murray et al. 1984). This question can be generalized and restated as "when there is a threat to the inside community, which strategy will you adopt to counteract that threat?"[6] Interestingly, many rumors, which are generally considered to be a hyperactive transmission state of legend, stop after reporting the complicating action: threat, pushing the action out of the narrative world, and into the real world (Tangherlini 1990). This abbreviation of the story could help explain Welch's decision to travel to the Washington DC pizza restaurant.

The resolution to the story details the outcome of the strategy. These outcomes can be anywhere on a scale from the very negative (death of an inside member, for example) to the ambiguous, to the very positive (destruction of the threat) (Tangherlini 2015). As such, the resolution provides an evaluation of the efficacy of the proposed strategies for dealing with a particular threat and is therefore deeply ideological. A quick review of the 1973 film, *The Exorcist*, helps illustrate this (Friedkin and Blatty 1973). When the integrity of the film's central family is disrupted by divorce, and the daughter Regan is subsequently threatened by Satanic possession, the initial response of the insiders (Regan's mother, her friends and family) is to turn to science as a strategy to deal with Regan's malady. First they consult a pediatrician, then specialists, then an entire room full of specialists. It is not until the family turns to the Catholic Church, and enlists a spiritual topgun in the figure of Father Karras, that the strategy begins to generate positive results. While Satan is ultimately repelled, and Regan restored to the family, the outcome is somewhat ambiguous as the threat of Satan persists (and returns in various sequels).[7] In short, the film endorses a reactionary Catholic ideology, challenging the efficacy of science along the way. This short example helps illustrate how legend, in its very structure, enables the negotiation of cultural ideology. It also reveals an aspect of storytelling often missed in straight-forward attempts at aligning stories with a postulated structure, namely that the three structural parts, Complicating Action: Threat/Disruption, Complicating Action: Strategy, and Result, can be repeated multiple times during performance within a single story.

Evaluative comments, which both Nicolaisen and Labov and Waletzky consider structural features, are considered to be features of story performance and, accordingly, are moved to the microscale. These comments are a crucial feature of the negotiated frame in which the story is told. The same can be said about the abstract and coda, which are framing devices that function as two specific classes of evaluative comments: the abstract signals the storyteller's intention to tell a story and, in its abbreviated form, constitutes a reinforcement of the story's inside actants or its reportability (threat or disruption), while the coda often acts as a confirmation or repudiation of the resolution's ideological evaluation of the complicating action's strategy.

4. Mesoscale: Domain and Narrative Framework

The main innovation of this model is at the mesoscale between the macroscale (tradition context/structure), and the microscale (performance context/story), comprising a generative narrative framework embedded in a knowledge domain (Barthes 1966). Including this intermediary level has several benefits. First, it provides a more realistic model for what fieldwork has revealed to be the negotiated nature of storytelling. Second it helps formalize the separation of emic level phenomena that are observable in performance, and the deeper etic level phenomena of structure (Dundes 1962; Barthes 1966). This formalization occurs through the domain, which limits the range of available emic features for etic structures. As noted, the performance context and the domain are linked through a mutually

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6   It is quite difficult to sing this generalized form of the question, and may help explain why this is not part of any film theme song.
7   Granted *The Exorcist* is a film and not a legend, but it is widely known, and deploys legend structure for its broad appeal, as do many other popular films.

constitutive feedback loop. In this loop, multiple versions of stories, story parts, and story comments create, over the course of repeated tellings, an immanent narrative or narrative framework (Clover 1986; Foley 1991). The model does not exclude the possibility of multiple competing frameworks emerging in the same domain. In certain cases, the frameworks converge (consensus), and in other cases, the frameworks diverge (polarization). Subsequent storytelling performances activate these frameworks in whole or in part. The storytelling process optimizes the stories and frameworks through repeated tellings and repeated activations of the framework. As the stories converge on a stable framework (or frameworks), they become highly efficient means for communicating aspects of cultural ideology.

The domain focuses on a particular area of knowledge—political conspiracy, witchcraft, Satan, theft, vaccination, etc. Already in the mid nineteenth century, George Boole proposed a definition of domain that is remarkably apt for folklore, stating that, "In every discourse, whether of the mind conversing with its own thoughts, or of the individual in his intercourse with others, there is an assumed or expressed limit within which the subjects of its operation are confined" (Boole [1854] 1958, p. 42). The domain imposes certain constraints on the narrative framework, which are partially described by Dégh and Vázsonyi in their discussion of "transmission conduits" (Dégh and Vázsonyi 1975; Dégh 1992) and refined by Fine in his discussion of social networks (Fine 1979). In any tradition context, domains can overlap as they do, for example, in nineteenth century Denmark, with the overlapping domains of folk healing, witchcraft, and Satan. In this brief study, the domains under consideration include political conspiracy (Pizzagate), supernatural beings and the religious (Danish witchcraft and cunning folk), and illness and healing (vaccination; Danish witchcraft and cunning folk), each with its own constraints of the types of characters and events that are admissible.

The narrative framework relies on legend structure but is embedded in a specific domain. This framework is based on an actant-relationship model and consists of three main components: a group of actants (people, places, things), a group of relationships between actants, and a sequencing of these relationships (Greimas 1973; Todorov 1966). The actants, which are sorted into inside, outside or liminal classes over the course of the storytelling, are dynamically linked through two-way relationships that, in the aggregate, present a complex network of actants and relationships. These relationships are either pre-existing or revealed during the course of the storytelling. Finally, the sequencing of the actant interactions and relationships, derived from the genre's formal structure, animates the stories.

The identity of the available actants—the actant pool—and the relationships between actants for any given narrative framework is limited by the domain. Eskeröd's concept of tradition dominants and von Sydow's theory of oikotypes provide the theoretical underpinnings for these constraints (Eskeröd 1947; Von Sydow 1934).[8] While the actant pool and their relationships can change, they do so slowly, in part because of the overwhelming power of other tradition participants as they tell stories related to the domain in networked interaction. If a story veers from the narrative framework in performance, it is usually perfectly acceptable for another person to interject with a correction or modification (Dégh 2001). If a storyteller resists these attempts to bring the proposed novel innovation back in line with what others have heard or told, the storyteller may lose the floor, or be passed over in subsequent storytelling interactions. Indeed, it is this ongoing pressure toward alignment with the existing accepted bounds of the narrative framework within a specific domain that led Anderson to posit the "law of self correction" (Anderson 1923, pp. 399–406).[9] Because of this conservative force, once a stable narrative framework has been established, it is unusual for innovative features to gain traction in storytelling.

8　　Honko has also shown how a domain can influence individuals' storytelling about otherwise inexplicable encounters (Honko 1964).

9　　It may be more apt to speak of a "law of auto alignment", where subsequent tellers realign the story with the emerging narrative framework. Cf. Vaz da Silva (2012, p. 43).

5. Microscale: Performance Context and Storytelling

The performance context rests on certain genre-driven performance features which can be derived from observation. Legend, for example, is performed in a conversational manner and told as true. Evaluative comments, including the abstract and coda, appear at this level, and provide information about the storyteller's own orientation toward the story (skeptical, credible, mocking, incredulous, enthusiastic, etc.). Because the story emerges in a performance context, this level allows one to capture information about the specific telling, which can be used to address who tells which story to whom, and how they spin that story. In a modification of von Sydow's concept of "tradition bearers", one can also identify the shifting subset of group members whose participation can be mapped to a broad scale from passive to active participation both in the domain and the performance contexts (Tangherlini 2008). Individual stories, comments and story parts are instantiations of the narrative framework, activating either the entire framework or, in most cases, small parts of it. The choice of actants, relationships and sequences reinforces those parts of the framework. Passing over certain actants, relationships or sequences, or proposing novel innovations, contributes, albeit incrementally and often slowly, to the evolution of the framework.

6. A Generative Multiscale Model

Putting these three scales together results in a generative model of legend as a multiscale traditional complex. The tradition context defines the cultural group or groups and recognizes the possibility that tradition contexts can intersect, instantiating the theory that folklore can be defined as cultural expressive forms circulating on and across social networks embedded in time and space. The structure provides a formal characterization of a genre that is recognized as part of the group's culture (Ben-Amos 1976). Here we focus on legend, but other genres could be similarly modeled. Embedded at the mesoscale in the tradition context are various domains of knowledge that limit the range of discourse for that domain. At this level, the narrative framework evolves dynamically. The framework, created on top of the underlying legend structure, represents a series of choices made by storytellers at the microscale over the range of available actants and relationships in that domain. To tell a story, a storyteller makes a selection of actants and relationships, and at least partially fits them to the emergent narrative framework. As more stories are told, the narrative framework becomes elaborated, while extraneous aspects are pruned away. This feedback loop leads relatively quickly to convergence on a stable narrative framework.[10]

This model is explored below for two collections of legends, one derived from a crawl of online social media blogs and housed in a computer database, and the other based on nineteenth century fieldwork and housed in a folklore archive.[11] In both cases, we identify a tradition group for which legend is accepted as a form of cultural expression (confirmed by the presence of legends in their communications). We then identify a target domain and identify the range of actants and relationships in that domain. Shifting between the stories-as-told and the emerging narrative framework, we reveal how the storytellers converge on a set of actants, relationships and events for a specific domain. In turn, this domain-constrained narrative framework acts as a generative model for tradition participants as they activate all or part of it to tell stories, as well as to comment on, and evaluate the stories that they encounter in that particular domain. Our work confirms the usefulness of this multiscale model, revealing the dynamics of legend in very specific instances, from vaccine hesitancy to nineteenth

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[10] As noted above, there can be multiple complementary or contradictory narrative frameworks in a single domain. These may converge (consensus), diverge (polarization), or remain in some form of dynamic tension.

[11] The former work is part of ongoing collaboration between myself and a group of computer scientists, engineers, and other "big data" specialists, while the latter work is part of my ongoing collaboration with librarians, archivists, and information scientists.

century witchcraft, and tracing the emergence of ideologically optimized narrative frameworks, and highly efficient stories in these domains.[12]

7. The Generative Model in Online "Archives": Vaccination Hesitancy and Anti-Vax Stories

A great deal of recent work in folkloristics has considered aspects of Internet-mediated communication (Blank 2012; Howard 2008; Buccitelli 2012). Of particular interest here are social media sites that allow for asynchronous interaction, and the sharing of narrative. Andrea Kitta, among others, has pointed to the long-standing domain of anti-vaccination attitudes in various groups, and has explored in significant detail the role that storytelling has played in creating and perpetuating various beliefs surrounding vaccination (Kitta 2012). Anna Kata (2010, 2012) has similarly explored the rhetorical strategy of anti-vaccination groups online in challenging the scientifically based arguments on which vaccination programs are based. In our work, taking a cue from Howard (2013), we focus on parenting websites where parents (predominantly new mothers) exchange stories about their experiences with vaccinations (Tangherlini et al. 2016). A great deal of the interaction on these websites takes the form of elaborated comment threads, where stories and counter-stories are interspersed with comments and story fragments. In all, we consider approximately two million posts on two popular parenting sites contributed by tens of thousands of individual users over the course of eight years.[13]

The work progresses through three stages: we identify the tradition community, we identify the domains that the community members discuss, and then we consider all of the posts within a domain. Since it is impossible to read millions of posts, no matter how engaging, we use automated methods to extract a topic hierarchy over the entire corpus as a means for identifying domains.[14] In this case, among the various domains we identify, we find one focused on vaccine exemption (Figure 3).
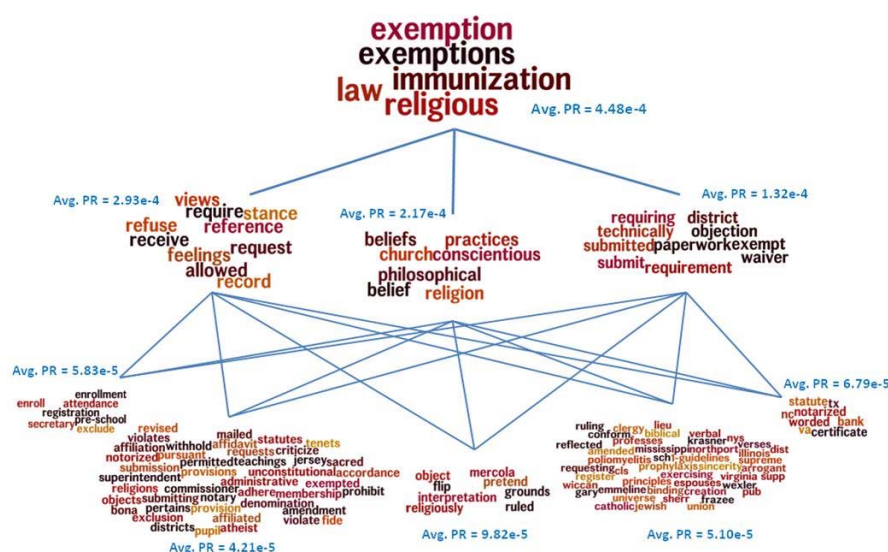
Figure 3. A visual representation of the "Vaccine Exemption" domain, identified from the numerous information and knowledge domains in two online parenting communities (Tangherlini et al. 2016).

After identifying a domain, we identify the aggregate pool of potential actants, and the relationships between the actants. We use simple natural language processing methods to discover

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the most frequent nouns, and align them into classes of actants (Table 1). We then consider each post individually to identify interactant relationships. These are discovered on a pairwise basis (e.g., among the relationships between children and parents is that parents protect their children).

Table 1. Actants in the Vaccine Exemption Domain.

Actant Class	Actant Identity
People	Parents Children Medical Professionals
Institutions	Schools Government Religious Institutions
Concepts	Exemptions Adverse Effects
Objects	Vaccines VPDs (Vaccine Preventable Diseases)

In the exemption domain, we find a limited and stable group of actants, whose pairwise relationships can be weighted according to the frequency with which those relationships occur in the storytelling and comments. We aggregate all of the actant-relationship pairs into the narrative framework. The resulting framework reveals that parents use their affiliation with religious institutions to secure exemptions from their medical providers to school mandated vaccines in an effort to protect their children from the adverse effects caused by vaccines. Intriguingly, vaccine preventable diseases (VPDs), while identified as an actant, have no significant pairwise relationships with any of the other actants, and the threat relationship to children as well as the protective relationship from vaccines is largely inferred (Figure 4).
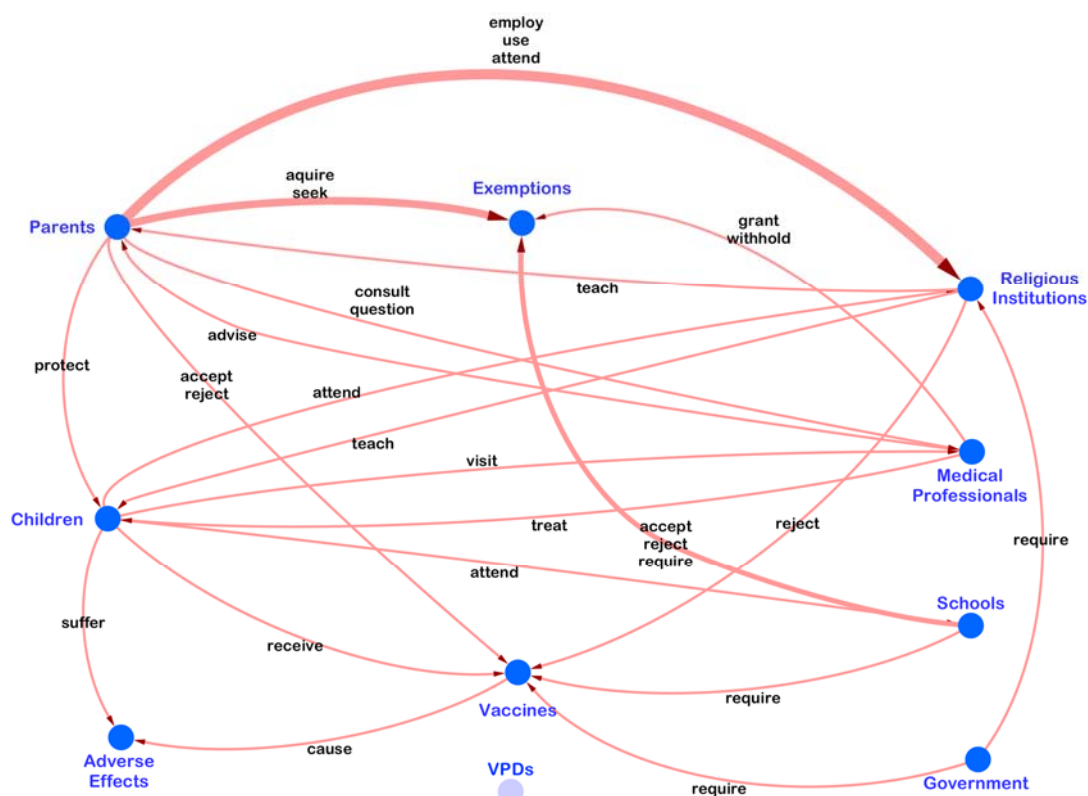

Figure 4. A visual representation of the actants and their relationships in the "Vaccine Exemption" domain in the traditions of two online parent communities (Tangherlini et al. 2016).

Individual stories, the phenomenon that we can actually observe, activate this framework in whole or in part, and contribute to the creation and reinforcement of that framework. The stories also provide the sequencing, aligning the actants and relationships with the legend structure. We accomplish this alignment using semi-supervised methods.[15] For example, a very brief story in one of the communities, reads as follows:

Phrase		Structure	Role	ID	Specification
A friend of my daughter	}	Orientation:	Who:	Child:	friend of daughter
got her "shots"	}	CA-Strategy:	Accept:	Vaccine:	her shots
for this one	}	CA-Threat:	Harm agent:	Disease	HPV—"this one"
and now has multiple health issues. Anxiety attacks, rashes, and a lot of fatigue.	}	Result:	Harm:	Health risks:	anxiety, rash, fatigue
My girl is not getting them.	}	CA-Strategy:	Reject:	Do not vaccinate:	not getting them
No way.	}	Evaluation:	Reinforce strategy:	Do not vaccinate:	no way

We align the story features (black) with both the domain (blue/brown) and the structure (green). Here, the daughter of the storyteller's friend has suffered adverse reactions from a vaccination for a VPD. As a result, the storyteller has decided to not vaccinate her own daughter.[16] A visual representation of the story shows the partial activation of the underlying narrative framework (Figure 5). Even this brief post reveals a level of narrative complexity which would confound standard structural models. Whereas the reported story is one where a parent chooses the strategy of vaccinating her child to protect against the threat of HPV, the results are disastrous. The storyteller, through her evaluative comments, rejects her friend's strategy, thereby signaling how she intends to act in respect to her own child: the protective action will be directed at the "real" threat agent, the vaccine, and not at the "alleged" threat agent, HPV. Her strategy is to reject the vaccines.
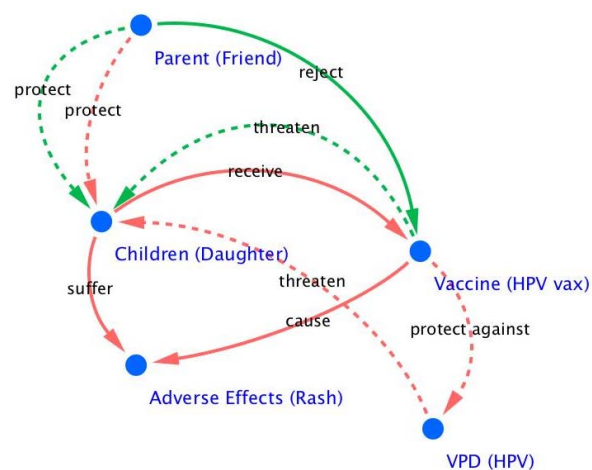
Figure 5. Partial activation of the "Vaccine Exemption" narrative framework in the reported story. Inferred relationships are presented as dotted lines for clarity. The embedded narrative is shown with red edges, while the frame narrative is shown with green edges.

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[15] Automated sequencing of events remains difficult and, to the extent we have done this, it has been a manual process and therefore only for a limited number of stories.

[16] Metadata indicates that the person posting this story is a mother.

At this scale, one can begin to interrogate why classes of tradition participants, or individual participants, activate certain parts of the narrative framework as opposed to other parts. If there are repeated stories from a person or a group of people, one can follow either a change in attitude (from vaccinate to don't vaccinate, for example), or a stability in attitudes. In our work, for example, we identified one mother who, through her participation in the parenting forums, moved from curiosity about vaccination to strongly rejecting vaccinations for her children. At the mesoscale, one can trace how the narrative framework changes over time, including potential shifts in the actants and their pairwise relationships, perhaps allowing one to catch the emergence of a narrative framework endorsing anti-vaccination strategies before these strategies are implemented and have broad negative consequences such as the diminution of herd immunity.

This brief case study illustrates a key feature of the model, namely that the narrative framework, and the performance-based instantiations of that framework, can be derived from the observed tradition. These scales, in turn, confirm the postulated existence of both the underlying tradition context, and the structure of a particular genre of expressive culture in that tradition. The model is data-driven, and allows researchers to base their insight across multiple scales into the dynamics of legend and tradition as a whole, derived from the observable/collected expressions of people themselves.[17] As such, it instantiates the macroscopic approach to folklore, "provid[ing] a 'vision of the whole,' helping us 'synthesize' the related elements and detect patterns, trends, and outliers while granting access to myriad details" (Börner 2011, p. 60). This approach is not only applicable to large scale data culled from the internet, but is equally applicable to archival data. While large corpora provide both confidence in the results, and stability on the level of the narrative framework, the methods can be applied to a corpus of nearly any size (although it seems likely that one would want to work with more than a single variant). Below, we explore the model in the context of a very large collection of nineteenth century Danish legends.

8. The Generative Model in Historical Archives: Danish Witchcraft Legends

Over the course of his sixty year career, the Danish schoolteacher, Evald Tang Kristensen (1842–1929), collected hundreds of thousands of stories, songs, and descriptions of everyday life from thousands of predominantly rural Danes. The collection was never published in its entirety but, during the last decades of the nineteenth century and the early decades of the twentieth century, he published two dozen volumes of Danish legends (Kristensen 1891–1894; Kristensen 1892–1901; Kristensen 1900–1902; Kristensen 1928–1939).[18] These have been digitized and structured in a relational database, making ~35,000 legends "machine actionable". Tang Kristensen devised his own classification scheme for the collection, which represented his best guess at the various, at times overlapping, domains that this tradition group addressed in legend. He was himself keenly aware of the limitations of the one story—one classification approach that he was forced to devise, lamenting, "I must ask the reader for forbearance on several fronts. First, the ordering of the stories, which has its difficulties; but it should be noted that where a story is obtuse or distorted, then the classification is based on a judgment. For example tale 388 (classified in "On prophecy and portents") could have been put in Section ix ("Fairytale-like legends"), 389 ("On prophecy and portents") in Section iv ("On revenants and all types of ghosts"), and 438 and 439 ("Religious legends") in Section vi ("On witchcraft")" (Kristensen 1880, p. i)." Despite these shortcomings, the classification does provide a reasonable, yet coarse, representation of singular domains. For example, all of the stories in the hidden folk volumes do include hidden folk, while all of the stories in the ghost volumes do include ghosts. In other work, we have explored alternative classifications for the collection, focusing on the ability of researchers to

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[17] For the purposes of brevity, we do not discuss the rise of "bots", or machine-generated content, that increasingly is appearing in social media; certain strategies are being devised to filter out this type of content (Ferrara et al. 2016). Oddly, the ability of bots to mimic human interaction in these domains indirectly confirms the generative model.

[18] These are abbreviated as DS, DSnr, JA and JAT.

generate new classifications that align with specific research questions (Abello et al. 2012; Broadwell et al. 2017).

In this work, we focus on pre-existing classifications as a first sort on the corpus. To illustrate that domains are often not exclusive, but rather overlapping, we aggregate several classifications to generate a single domain. In this case we aggregate stories classified as being about witches and those classified as being about cunning folk into a single domain. This grouping is not random, but rather is predicated on a hypothesis concerning the overlap between cunning folk and witches in late nineteenth century Denmark related to ongoing debates related to social, political, and religious organization (Tangherlini 2000).

To test the validity of our aggregate domain, we implement a similar topic modeling approach that we used for the vaccination narratives over the entire corpus. We discover a clear overlap in the "witchcraft" topic and the "cunning folk" topic at a level of thirty topics. Legends in these overlapping topics appear in the volumes classified as "Witches and their Sport" (DS VII, DSnr VI) and "Cunning women and men and their work" (DS VI, DSnr V). We consequently can validate this grouping as an aggregate "domain". A new topic model is generated for just the texts in this domain (3127 legends), and that is used to discover the actants as well as to aggregate individual words into these actant classes (e.g., "hired girl", "farmhand", and "milkmaid" are aggregated to the "workers" category) (Table 2). Because of the challenges of working with dialect and nineteenth century Danish orthography, the discovery of pairwise relationships between actants requires a supervised approach; given the relatively small size of the corpus, this can be accomplished in a reasonable time frame and, in many respects, echoes most earlier folkloristic work with large archival resources.

Table 2. Actants in the Cunning Folk–Witch Domain.

Actant Class	Actant Identity
People	Farmers Workers
People (liminal)	Cunning folk Ministers Minister's wife Witch
Supernatural	Satan
Animals	Animals Farm Animals
Concepts	Powers
Objects	Tools Farm Produce Books
Places	Farms Roads

A visual representation of the narrative framework extracted from this domain reveals the complexity of the framework (Figure 6). The complexity may in part be due to the years of telling and retelling which drives the framework, and it may in part be due to the intersection of the overlapping domains of witchcraft and cunning folk.[19]

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[19] Välk explores the interdependence of domains in relation to Estonian folk religion (Valk 2001).
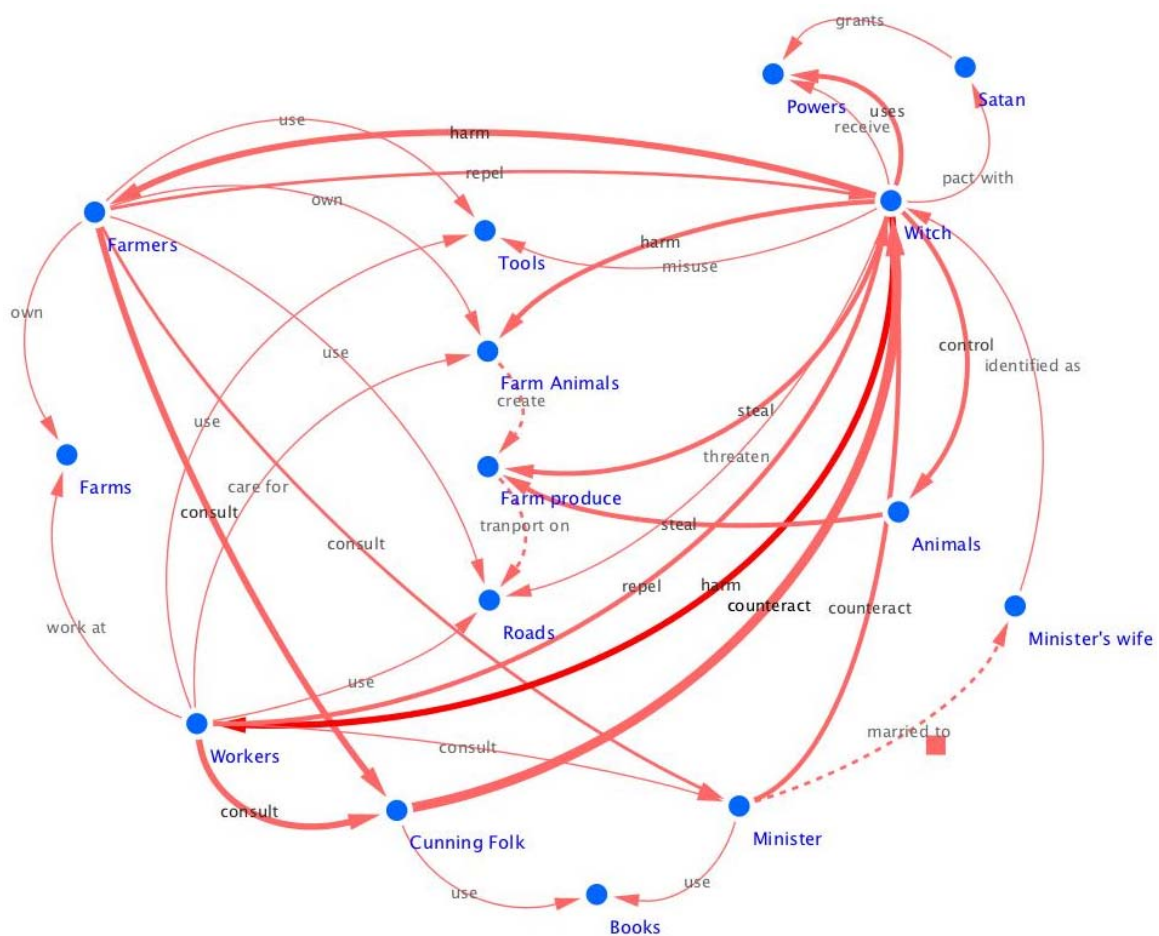
Figure 6. The narrative framework, extracted from 3127 legends, for stories about witchcraft and cunning folk. Several relationships, represented by dotted lines (farm animals create farm produce, farm produce is transported on roads, and ministers are married to their wives), are inferred. Several relationships are more common, with the edge width corresponding to the estimated frequency of these relationships.

Individual stories in this collection are often more elaborated than posts on the internet sites considered above. Part of this "completeness" may be attributable to editorial practices, where stories are adjusted to make them cohere in a published collection (Tangherlini 2008). It may also be an artifact of the collecting process itself, where the field collector engages in a dialogue with the informant to solicit information which might otherwise not be forthcoming in performance (Palmenfelt 1994). Many of the stories also include some form of evaluation, allowing us to situate the story within the informant's repertoire, and world view particularly vis-a-vis social, economic, and political issues (Tangherlini 2013; Pentikäinen 1978; Siikala 1990). Consider a story told by Marie Johansen, and cataloged by Tang Kristensen as DS VII, 134, Witches and their sport: Shot witches in hare or cat shape:

Phrase		Structure	Role	ID	Specification
Et sted i Sundeved	}	Orientation:	Where:	Farm	Sundeved
boede en kone, som hed Else Mikkels	}	Orientation	Who:	Person	Else Mikkels
Denne kone gik omkring og gjorde så megen fortræd,	}	CA: Threat	Harm agent:	Witch	Threatens people
hun tog mælken fra koerne	}	CA: Threat	Harm agent:	Witch	Steals milk from cows
eller listede sig ind i husene og kastede noget for svinene, så de foer forstyrrede og forvildede omkring	}	CA: Threat	Harm agent: Harm loc:	Witch Inside	Harasses swine In the houses
Kom så nogen, skabte hun sig om til en hare	}	CA: Threat	Harm agent:	Witch	Turns into hare
og når pigerne om morgenen kom ud i marken for at malke	}	Orientation	Who: Where: When:	Hired girls Fields Morning	
kunde de se hende gå og luske omkring henne i et hjörne af marken, og da var hun en hare	}	CA: Threat	Harm agent: Harm loc:	Witch Fields	Runs in field as hare
En dag hun som sådan løb omkring,	}	CA: Threat	Harm agent:	Witch	Runs in fields
blev hun skudt i det ene ben	}	CA: Strategy	Protection:	Shoot	Shot in leg
og hun måtte da ligge til sengs i lang tid	}	Result	Harm:	Injury	Bed long time

Translation:

A woman named Else Mikkels lived at a place in Sundeved. This woman went around and harmed so many people, she took milk from the cows, or she snuck into the houses and threw something on the swine so they ran about dazed and confused. If anyone came, she turned herself into a hare, and when the hired girls went out to the fields in the morning to milk they could see her lurking about down in one corner of the field, and she was in the shape of a hare then. One day when she was running about like that, she got shot in one of her legs, and she had to stay in bed for a long time.

Here, the witch is ascribed numerous threatening features, particularly her propensity to steal milk and disrupt the normal functioning of the farm. The strategy that the people on the farm adopt is to take action themselves, a strategy that aligns with an increasing focus on local solutions to local problems in late nineteenth century rural Denmark. The hare is shot, injuring the witch, and causing her to remain bedridden for a considerable time. When we map the various actants and relations referred to in the story, it is clear that the story activates only a small part of the larger narrative framework, but does not propose any new actants or relationships (Figure 7).

If we perform the same task for all of the stories in the corpus, we arrive at the narrative framework visualized earlier (Figure 6), and any new story related to the domain can be aligned with the framework. We can then observe which parts of the framework are activated, and immediately identify innovative actants or relationships when they appear. Relationships become more pronounced the more they appear in the storytelling (while others may fade away). By separating narrators into classes, either by gender, by age, geographically, or any other discoverable criteria, we can understand how opinions in a specific domain are negotiated over time.
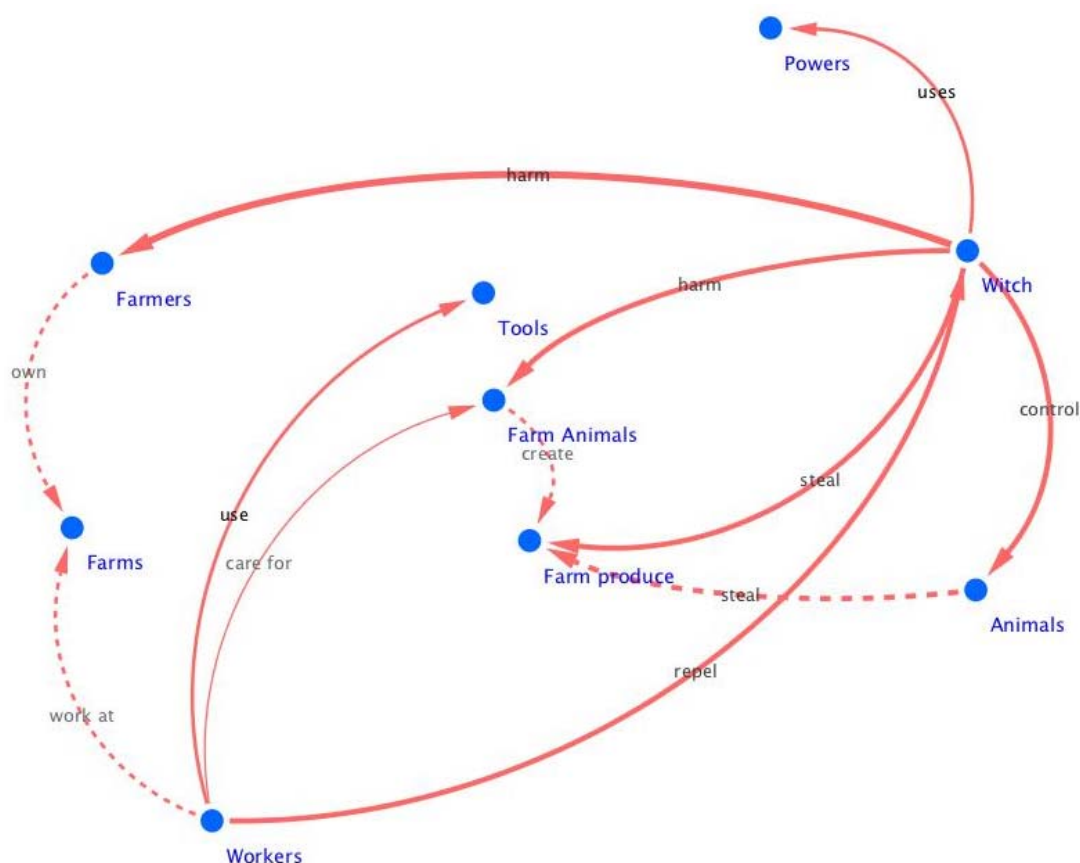
Figure 7.　Activation through legend performance of a small part of the much larger witchcraft—cunning folk domain in Danish rural tradition. Inferred relations are represented by dotted lines. There are no differential weights on the edges since this graph represents a single telling/activation of the narrative framework.

The generative model recognizes that domains often intersect, allowing for aggregate narrative frameworks, and generating stories that cut across classification boundaries (Broadwell et al. 2017). While it is unlikely that storytellers consciously make use of the narrative framework to generate their stories, the immanent narrative informs expectations of what a story in this domain will recount. Indeed this concept of expectations is echoed already in the memoirs of one of the earliest folklore fieldworkers, the Dane Just Matthias Thiele. Expressing frustration at the predictability of storytelling, he wrote about his fieldwork experience in the early 1820s:

> Naar nu en ærlig Bondemand begynder at fortælle, kan jeg som oftest, naar jeg blot har hørt ham begynde, sige ham, "Ja, tie nu, Fa'er! Saa skal jeg fortælle jer Resten!". (Thiele, vol. 3, pp. v–vi)

> [When an honest farmer begins to tell, I can, more often than not, as soon as I've heard him start, say, "OK, be quiet now, my good man! I'll tell you the rest!"].

Thiele indirectly suggests that the narrative framework for any domain is stable and limited, and that this framework constrains the storytelling to a high degree. A storyteller who wants to participate in the negotiation of norms, beliefs and values in a particular domain—here the domain of witchcraft and cunning folk—draws actants and relationships from the domain-embedded narrative framework, and sequences the events according to the genre structure. It is this predictability against which Thiele reacts. His comments miss, however, an important aspect of performance: An individual's orientation toward the story emerges in performance not only through the endorsement of successful strategies or

the rejection of unsuccessful strategies, but also through the evaluative and framing comments that Thiele misses by cutting his informants off. With this comment, Thiele tips his hand, revealing that he does not recognize the role that storytelling plays in the ongoing negotiation of cultural ideology.

9. Conclusions: A Return to Pizzagate

The rise of Pizzagate, and the reactions that it engendered, should not be surprising. The stories did not arise out of nothing, but rather were embedded in a well-known domain in American informal culture: political conspiracy, malfeasance and corruption. The thousands of stories and comments on those stories, which we can collect thanks to the Internet and social media, relied on the existence of this domain for an accepted pool of potential actants and relationships. Real world scandals, such as Bridgegate and the iconic Watergate (after which all political cover-ups are named, indirectly confirming the existence of the domain) provided ample momentum for the acceptance of additional narrative frameworks, such as Pizzagate, into the domain. The Pizzagate stories then activated and reinforced this newly emergent narrative framework, while allowing for a degree of drift: new actants and relationships, along with events were proposed, negotiated, accepted or trimmed away as the stories and story parts circulated on social networks.

Work with vaccination hesitancy and witchcraft confirms that the multiscale model is not only applicable to political conspiracy and internet conversations. Rather, the multiscale approach provides a dynamic generative model for legend that recognizes the fuzziness of performance and the stability of tradition. Domains change over time, and tradition participants can have ever-changing degrees of engagement with a tradition domain. In our study of parenting websites, for example, we discovered an average participation window of approximately two years, a timeframe that maps well onto the period in which infants are vaccinated and parents are actively making vaccination-related decisions (Bandari et al. 2017). At the same time, we discovered that, despite the turnover in participants, the domain and the narrative framework remained remarkably stable, as did the underlying tradition community of parents and the genre of legend as a recognized form of communication. On the level of performance, the model recognizes the negotiated and dynamic nature of cultural expression. When storytellers tell stories, they activate parts of the underlying framework, thereby reinforcing parts of the framework; at other times, they propose modifications to the framework, offering new actants or relationships, or ignoring or reconfiguring others. Similarly, the model recognizes that people frame and evaluate their narratives in performance: although a storyteller might activate a particular strategy to deal with the threat of a witch-as-hare for example, the evaluative comments may undermine that strategy even if the result is positive.

There are many refinements that can be made to this model as it is tested against an increasingly broad range of cultural expressive forms. It would be interesting to model multiple expressive genres in a single domain—images, songs and legends about life in terrorist organizations for instance—to understand how the various forms constitute and activate the underlying framework(s). Similarly, it would be interesting to explore more overlapping or intersecting domains, as was done with the cunning folk and witchcraft domains for nineteenth century Denmark. While most of the work here has been done with large scale collections, it would be worthwhile to apply the model to much smaller corpora. One could, for example, test the story corpus size at which a narrative framework becomes stable, and the range of stories generated by that framework becomes more predictable. It would also be worth exploring how long a narrative framework can remain stable in a particular domain. Explorations of Danish witchcraft stories, for example, reveal a remarkably stable set of locations associated with witchcraft, spanning several centuries (Broadwell and Tangherlini 2016). Understanding the trajectory of stories as they create and reinforce a narrative framework in a domain is equally compelling. What impact does hyperactive transmission (rumor) have on the emergence of stable narrative frameworks? How resistant are people to narrative frameworks that propose a competing view of a particular domain? The consideration of converging and diverging narrative frameworks in a particular domain is an area that calls for substantive investigation. How

does consensus form? How does polarization occur? Exploring how performance contexts, be they face to face or mediated through the Internet, influence the storytelling dynamic can also help us understand how communities of belief emerge and how they maintain their stability, while also helping us recognize how they fall apart. By moving between scales, and learning at each scale, we can understand the complex folkloristic phenomena that have a profound impact on decision making in areas as broad as health, economics, migration, transportation, economics, and religion—in short, the very foundations of civil society. At no time in American history has this type of understanding been more needed.

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