Introduction

Contemporary sociology is currently witnessing a growing interest in the dynamics of social structure and in the cultural aspect of social organization (the "cultural turn"). When the two merge, investigators quite naturally direct their attention to stories as scripts for social action, because stories combine structure, culture, and the dynamics of a plot (e.g., see Bearman and Stovel 2000; Franzosi 2004; White 1992, 1993). As Harrison White eloquently states: "Social organization can be seen as the interlocking of *stereotyped stories* that actors proffer and through which they perceive and perform and maneuver. Cultural and social organization thus wind around each other" (White 1993: 194). This paper explores stereotypes of stories and the models for roles and scripts that they contain.

According to White, "Literary criticism has much to say about stories and their grammars and voices." (White 1992: 21). In this paper, I explore one of the lessons (or insights) that literary theory may have for sociology. The seminal work of Vladímir Propp – *Morphology of the Folktale* (1928) – which inspired most of the later work on story grammars and narratology, offers a concise set of propositions on the basic form and plot of a large corpus of Russian fairytales. Because Propp's ultimate aim is the construction of a scientific typology of folktales, his work focuses exclusively on the structure of stories. However, I will show that his theory can also be applied to social structure provided that the propositions are conceptualized as dynamic signed networks (graphs).

It will be shown that each basic character or role in the fairytales can be identified by a unique order of positive or negative actions between two actors. One sequence is associated with the role of the villain in a fairytale, another with the role of the parent, etcetera. Thus, fairytales offer models for interpreting sequences of positive or negative interactions in any social setting. They offer cultural templates for behavior. Application to an empirical social network corroborates the hypothesis that people adjust their identity and subsequent behavior to the fairytale meaning associated with the pattern of their affective ties. This sheds new light on the impact of local action on the formation of social roles as proposed by Leifer (1988).

In addition, the stereotyped script of Russian fairytales is shown to be captured by a simple rule on the nesting of positive and negative actions and reactions within pairs of actors. This offers a cultural script for social action: when to act or react in a social setting. The nesting rule complements turn-taking mechanisms that were recently investigated by Gibson (2005). To conclude, this paper explores two ways in which fairytales offer formal models or grammars for social interaction: roles and scripts.

Propp's morphology of the folktale

Propp's work on the Russian fairytale was conceived within the context of an academic movement known as Russian Formalism. This movement consisted of linguists, scholars of literature, and ethnographers that searched for general or universal features and laws for the structure of literary work. Due to their highly conventional structure, fairytales and folktales offered interesting material to the Russian Formalists. Vladímir Propp, although not the first to study these stories, created the most elaborate account on the structure of fairytales: *Morphology of the Folktale*. Published in 1928, however, his book did not reach an international audience quickly. The first English translation appeared in 1958 and an Italian translation was published in 1966. From that time on, Propp's ideas were picked up by many scholars and are still being used in several disciplines: anthropology (Colby 1973; Colby et al. 1991), linguistics (Herman 1997), computer applications (Fairclough and Cunningham; Havholm and Stewart 1996; Klein 1975), and sociology (Franzosi 1998).

Just like most story grammars and narratologies, Propp's main concern is the understanding of stories: creating text typologies and finding rules or criteria for constructing correct (well-formed) stories. As Alan Dundes points out in his introduction to the second edition of the English translation of Propp's book, Propp's approach to the formal structure of stories is different from the angle that later narratologists (e.g., Greimas, Barthes) and cultural anthropologists (Lévi-Strauss) take (Dundes 1968: xi-xiii). While the latter stress the fundamental cultural or social distinctions that are exemplified in the structure of the stories, Propp focuses on the linear sequence of events within stories. Propp's morphology contains a syntactic, dynamic aspect that is highly relevant to the notion of scripts for action and that is neglected in much later work in narratology. It will be shown that Propp's results point out the cultural significance of the order in which positive and negative actions appear, that is, their association with particular interpretations (parent, villain, donor). For this reason, I take Propp's work as my starting point for translating story grammars to sociology.

The beauty of Propp's morphology is that it offers a very concise model of characters and functions that is immediately recognizable; reading Propp, one feels as if one's intuition about fairytales is spelled out for the first time and one immediately sees that they fit the fairytales that one is familiar with. This suggests that they are part of our tacit knowledge: schemata operating below the level of our discursive knowledge. According to Propp, the Russian fairytale contains at most seven types of characters: villains, donors or providers, helpers, princesses (sought-for persons) and

kings, dispatchers, heroes, and false-heroes (Propp 1968: 79-80). Each of the characters is connected to a set of functions (acts, events) and Propp claims that all Russian fairytales contain no more than 31 different functions (Propp 1968: 25-65). Propp's central claim is that functions always occur in the same order within the tales, but they do not occur in each fairytale. This claim incorporates the main sequential (or syntactic) aspect of his morphology and it is very important to the argument presented in this paper. My conjecture is that the temporal pattern of positive and negative acts in fairytales is meaningful in the sense that people pay attention to and interpret temporal patterns of their social relations in a similar way.

An example of a fairytale may help to understand Propp's analysis. The example is the fairytale of the Swan-Geese as it is presented by Propp (1968: 96-98). The notes at the right refer to the functions that appear in the story according to Propp. Greek letters refer to functions in the preparatory part of the story and Roman letters indicate functions in the tale's main body or complication. Additional numbers in superscript or subscript denote variants of a function. Other numbers indicate events or attributes connected to the characters.

There lived an old man and an old woman; they had a daughter and a little son.[1] "Daughter, daughter," said the mother , "we are going out to work and we will bring you a little bun, sew you a little dress and buy you a little kerchief. Be wise, take care of your little brother and don't leave the courtyard."[2] The elders went away,[3] and the daughter forgot what they had ordered[4] her to do. She placed her little brother on the grass under a window and ran out into the street and became absorbed in playing and having fun.[5]

1. Initial situation (α).

2. Interdiction, intensified with promises (γ).
3. Departure of the elders (β^1).
4. Violation of the interdiction is motivated (M).

5. Violation of the interdiction (δ^1)

The swan-geese flew down, seized the little boy and carried him away on their wings.[6]

6. Villainy (A^1).

The little girl came back, looked, but her brother wasn't there.[7] She gasped and rushed hither and thither, but he wasn't anywhere. She called out; she burst into tears, wailing that harm would come to her from her father and her mother, but her little brother did not answer.[8] She ran out into the open field;[9] the swan-geese sped away into the distance and disappeared beyond the dark wood. The swan-geese had long before acquired an ill fame, caused much mischief, and had stolen many a little child. The girl guessed that they had carried off her little brother, and she set out to catch up with them.[10] She ran and ran until she came upon a stove.[11]

7. Rudiment of the announcement of misfortune (B^4)

8. Detailing: rudiment of trebling.
9. Departure from home on a quest (C↑).

10. Since no dispatcher is present to inform of the misfortune, this role is transferred to the villain himself, after a certain delay [...].
11. Appearance of the tester [...] (71, 73).

"Stove, stove, tell me, where have the swan-geese flown?"

"If you eat my little rye-cake, I'll tell."[12] "Oh, we don't even eat cakes made of wheat in my father's house."[13] (A meeting with an apple tree and a river follows, Similar proposals and similar insolent replies.)

She would have run through the fields and wandered in the forest a long time if she had not by good fortune met a hedgehog.[14] She wished to nudge him,[15] but was afraid of pricking herself.[16] "Little hedgehog, little hedgehog," she asked, "did you see where the swan-geese have flown?[17] "Away, over there," he pointed.[18]

She ran and came upon a hut on chicken legs. It was standing and turning around.[19]

In the hut sat Bába Jagá, hag-faced and with a leg of clay.[20] The little brother also sat there on a little bench,[21] playing with golden apples.[22]

His sister saw him, stole up, seized him away,[23,24] and the geese flew after her in pursuit;[25] the evil-doers were overtaking them; where was there to hide?

(Once again a triple testing by the same characters, but with a positive answer which evokes the aid of the tester himself in the form of rescue from pursuit. The river, the apple tree, and the stove hide the little girl.[26] The tale ends with the little girl's arrival home.)

12. Dialogue with the tester [...] (76, 78b).

13. An insolent answer, negative reaction of the hero. This provokes a trebled repetition.[...] (E neg.)

14. Appearance of the thankful helper (F_6^9).

15. Helpless status of the helper without a request for mercy (d^7).

16. Mercy (E^7).

17. Dialogue (§).

18. The thankful hedgehog becomes a helper who shows the way ($F^9=G^4$).

19.Dwelling of the villain (92b).

20. Physical appearance of the villain (94).

21. Appearance of the sought-for person (98).

22. Gold is one of the typical details of a sought-for personage. Attribute (99).

23.Receipt, through the application of cunning or strength (K^1).

24. Return is implied but not mentioned (↓).

25. Pursuit, chase in the form of flight (Pr^1).

26. Deliverance from pursuit (Rs^4).

Propp has chosen this example because it is the shortest fairytale in his corpus and it is simple in the sense that it contains only one *move* (plot). As we will see later, fairytales may consist of several moves, which are either ordered sequentially, e.g., the hero comes home but experiences a new villainy that starts another plot, or they are nested, e.g., while liquidating one sort of villainy, the hero experiences another that must be solved first. Another important aspect of the morphology is the *trebling* (repeating) of functions or sets of functions, for example, the repeated interaction with potential donors to find out the whereabouts of the swan-geese or secure a hiding place.

Fairytale roles

As stated above, the aim of this paper is to translate or formalize Propp's story grammar in such a way that it can be applied to social structure outside stories. It should be noted from the outset that this approach is necessarily and purposely

reductive; Propp's level of detail in describing situations, events, characters and their attributes must be discarded in order to transfer the tale's structural aspects to social life. We don't ordinarily encounter huts on chicken legs in our society. The formalization will yield social roles that are purely structurally defined; they are assumed to derive their meaning or connotation from the fairytales. While fairytales train children to interpret the meaning of interaction sequences from stereotyped attributes ('this person is a witch so this way of interacting is bad'), humans are hypothesized to do the opposite in their social interaction ('this is typically the interaction of a witch, so s/he is a bad person').

In my formalization of Propp's morphology, the actions among characters in a story are represented by signed directed relations. Propp's major functions are linked to the actions the characters take toward one another, which may be characterized as positive (helping, giving something valuable) or negative (hurting, deceiving, retaining vital information). Represented by a signed directed graph, well-known structural properties, such as the ones predicted by balance theory, can be applied to the structure of the tales. This approach is not novel because, for instance, Jane Auster and Frank Harary have already applied balance theory to tales, drama, and opera in this manner (Auster 1980; Harary 1963, 1966). Patrick Doreian has also analyzed a movie in terms of balance theory (Doreian 2004).

If we transfer Propp's example of the swan-geese into a signed digraph, we obtain a very regular graph with all relations involving the hero of the Swan-Geese tale: the little girl (Figure 1). Reading the sociogram clockwise, the girl disobeys her well-meaning parents (a negative act toward the parents that nourished her), a villain (the swan-geese) hurts her by abducting her little brother, she acts insolently or respectfully toward potential donors (stove, apple tree, and river), which refuse or provide help to her, she finds and defeats the villain (the witch, who is the same character as the swan-geese), and, helped by the donors, she finally arrives home with her brother making up for her disobedience. Note that a reaction (black arcs) is displayed on top of the initial action (straight gray arcs) between two characters and that, according to conventions, positive acts are depicted by a solid arc and negative acts are drawn as dashed arcs in Figure 1.

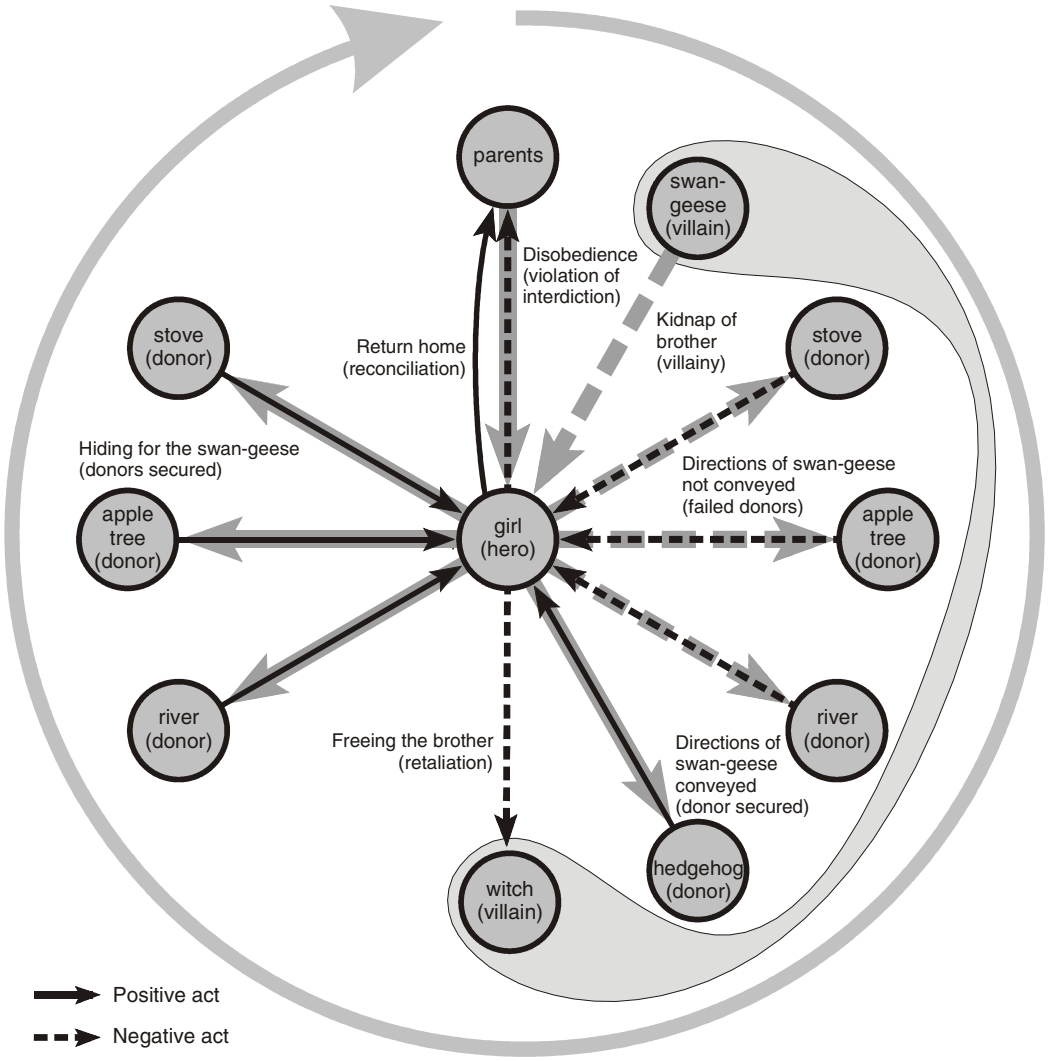

Figure 1 - The tale of the Swan-Geese as a signed directed network.

From Figure 1, it is immediately apparent that the story is highly balanced: almost all dyadic ties are balanced – action and reaction both being either positive or negative – and the only unbalanced dyad at the start of the fairytale, viz., the hero's disobedience toward the well-meaning parents, is balanced at the end of the story when the girl makes up for her disobedience. In the end, the story is balanced if we replace the initial negative act of the hero toward her parents by the final positive act. This result is in line with the findings of Auster and Harary (Auster 1980; Harary 1963, 1966) and it suggests that when fairytales help people to structure their social lives, they learn them to count on and strive for balance: don't harm your benefactors; combat your enemies; and expect reciprocity from potential donors. Stories such as these fairytales socialize people into a culture of balance.

The structure of the fairytale as a signed directed network shows another new result. Each role in the fairytale, assuming that the swan-geese represent the witch, is connected to a particular temporally ordered sequence of interaction with the hero. Taking into account the direction, sign, and order of the acts (arcs) within a tie, we can define the role of a character within the fairytale by a unique tie to the hero.

The parents, who care for the hero but who are disobeyed or hurt, are identified by a tie consisting of a positive act toward the hero, which is followed by a negative act from the hero. The parents represent the role of a harmed benefactor. In the end of this tale, the tie is extended with a positive act from the hero to the parents, representing the reconciliation of the hero with her parents. The third act, however, is not necessary for defining the parent role.

The villain is a character who acts first, harming the hero. As a reaction, the hero retaliates the villainy by defeating or deceiving the villain, inflicting harm, or stealing something valuable. The pursuit of the hero by the defeated villain or its substitutes extends the temporally ordered tie with a third action (negative toward the hero) or it can be seen as a new act of villainy. Propp notes that a lack rather than villainy is the cause for the hero's quest in some fairytales, arguing that they basically have the same function. For the sake of simplicity, I will restrict my argumentation to true villainy.

A donor, tester, and helper typically are characters to whom the hero must make the first move. The donor offers a neutral proposal, which the hero has to accept or decline. Then, the hero receives as good as she gets from the donor, establishing balance or reciprocity at short term or with a delay in the case of a helper appearing later in the story.

I will skip the remaining characters, which are not included in the tale of the swan-geese, such as the dispatcher, a character that requests, commands, or allows the hero to set out on a quest, the princess and king, and the false hero. The dispatcher's act toward the hero cannot be assigned a positive or negative value in general because the dispatch function is sometimes fulfilled by the parents and other close relatives, or by the villain. The false hero and princess/king roles seem to be connected to signed structures involving the hero and two other characters rather than the hero and one other character. Since these structures are more complicated and not represented in the example, I postpone the discussion to later work.

Templates for emergent social roles

Now that the fairytale roles can be identified by merely looking at the positive or negative value (sign) and the temporal order of the acts within a tie, we can strip the

attributes from the characters that are specific to the fairytale from the morphology and we can determine fairytale roles in any signed social network. It is my conjecture that stories like fairytales teach people, esp. children, that particular roles are connected to particular types of ties, that is, sequences of actions. The stereotyped attributes of the characters communicate the positive or negative value of particular sequences of action. In the case of the Russian fairytale, one learns to recognize the villainy of someone hurting you, the ineffectiveness of approaching a potential donor negatively, etcetera. In real life interaction, these lessons are being utilized, attributing positive or negative roles to the people with whom one is interacting from the temporally ordered pattern of ties. Finally, people are likely to adjust their (re)actions to the roles that they attribute to others, developing ties in accordance with these roles.

Some support for my conjecture, that people pay attention to the temporal pattern of positive and negative acts and interpret them in ways comparable to their meaning in fairytales, is found in relational therapy. In marital crises, for instance, the punctuation of events is thought to play an important role (e.g., see Watzlawick et al. 1967). Much of the argument is about who started the problems, which is about assigning the villain role in the semantic universe of fairytales.

What is the relation between fairytale roles and social roles as sets of norms and expected behaviors? In general, fairytale roles are connected to norms and behaviors: they tell humans how to act and react. However, the fairytale roles villain (witch), donor, or hero are not institutionalized like social roles such as teacher or student, doctor or nurse. They are expected to appear primarily in settings in which roles are not defined and fixed but constructed or enacted during the interaction process as suggested in interactionist role theory (comp. Baker and Faulkner 1991: 280-281).

Eric Leifer developed an important theory on the emergence of social roles in interaction (Leifer 1988). He formulates the concept of local action, which is a mechanism that peers, that is, people with very similar social characteristics, use to assign roles to themselves and to each other. Every person is assumed to long for high status roles but waits to claim such a role (creating ambiguity) until it is clear from the peers' actions that this role is granted. A claim is granted if one or more persons assume a complementary role in the interaction, e.g., if alter is always giving something, s/he seems to accept the role of giver, so ego may claim the role of taker. Leifer stresses that a particular role may both confer and take away status, depending on the appreciation of the role within the peer group or in other 'publics' (Leifer 1988: 876).

The fairytale roles fit nicely in this theoretical framework because they are also paired into complementary roles. The temporally ordered ties among actors that represent fairytale roles – I will abbreviate this to *fairytale role ties* – are defined from the perspective of the hero. In the swan-geese tale, for instance, the stove is a negative donor to the girl because the girl (hero) is the person who makes the first (negative) move. There is no donor without a receiver. In addition, there is another duality among fairy roles. From the perspective of the stove, the girl is a villain because she is rude to it without evident cause. In a social network, every actor will consider himself or herself as the focal person or hero of the story. As a consequence, fairytale roles must be identified from the perspective of each actor within the network; if ego is a villain towards alter, alter is a failed donor to ego.

Fairytale roles offer a solution to an unsolved problem in Leifer's model, viz., the set of roles from which actors may choose. In his text, Leifer implies the existence of such a set but neither specifies the elements of this set nor the ways in which the actors learn about them. Fairytale roles offer answers to both questions: a set of roles defined as interaction sequences and learning about them through hearing and reading fairytales. In addition, the concept of fairytale roles simplifies the question when a particular role confers status (is a coveted role) and when not. According to Leifer, the status of a role must also be settled during the interaction, which yields a process that is hard to predict or model because both the roles and their status are endogenous variables. With fairytale roles, the status is exogenously fixed: some roles are good (hero, donor, or parent), some are bad (villain).

One may object that the fairytale roles model is too strict to account for the seemingly chaotic and ambiguous behavior that we encounter in most social settings. However, we must first realize that this is a cultural model and we cannot assume that all actors are equally socialized into this culture and that they are socialized into the same culture. Propp's results pertain to Russian fairytales; although they seem to apply to Western fairytales in general, there is no reason to assume that they are universal. The 'hit first and hit hard' strategy for winning many computer games, for example, hints at a different cultural interpretation of interaction sequences.

Second, we need not assume that having one tie of a particular type definitively assigns the accompanying fairytale role to a person. It is much more likely that people gradually accumulate ties of a particular kind. We will see this in an application to an empirical social network to which we turn in the next section. Assuming a commonly known set of fairytale roles, it is quite straightforward to postulate that people monitor the types of ties collected by people in their network. Thus they can see when a person is accumulating a particular type of tie and decide whether they want to act on it. The

ambiguity is not necessarily situated in the dyadic interaction, as suggested by Leifer; it may well be found in the entire set of interactions that make up a person's network.

Third, because the balance model of fairytale roles applies only at the level of the temporally ordered dyads in which a given ego is involved, no global properties of balance in the networks are implied. The lack of global network balance may account for what we take as the chaotic and ambiguous behavior often encountered in social settings.

Fairytale roles in a social network

Let us see whether the fairytale roles occur within a real social network and whether the cultural (fairytale) meanings implied by the roles explain the events there. My case is a network of circa five hundred evaluations among forty literary critics and authors in the 1970s. For a description of the data and previous analyses, see (de Nooy 1991, 1999, 2002). This is the kind of network described by Leifer: the people involved are quite similar because they have passed institutional selections and have similar roles (author and/or critic). They are all highly educated and they have published at least one book with a literary publishing house. In addition, most of them started their literary careers in this decade, so they are very eager to make their names. It is therefore to be expected that they are eager to obtain status within the literary field. The evaluations among authors and critics were published in reviews and interviews and they were classified as positive, neutral, or negative, which constitute a signed network spanning 11 years (1970-80). The evaluations are exactly dated, so it is possible to determine the order in which people act and react towards one another.

In contrast to a fairytale, ties among two persons may contain many more acts than two or three over time. One critic, for instance, reviews an author's work no less than ten times in the dataset. If, at a certain point of time, the author passes judgment on the critic, with which of the critic's evaluations should we link it when we are trying to determine the type of fairytale role? To make the fewest assumptions, I decided to pair an evaluation with the last preceding evaluation which points in the opposite direction. In other words, if two successive evaluations between two persons point in opposite directions, they count as a pair and they are classified according to the corresponding fairytale role. The third act within the parent role, that is, reconciliation by the hero, needs some further decisions but since this act does not occur in this case, I will not go into details here.

Table 1 - Fairytale role ties in the network of evaluations.

Tie type	Number	Number of recipients (1st actor)	Number of senders (2nd actor)
++	19	14 (securing a donor)	14 (willing donor)
--	22	13 (villain)	11 (unwilling donor)
+-	11	6 (parent)	8 (ungrateful child)
-+	8	7 (no fairytale role)	6 (no fairytale role)
(+-)+	0	0 (reconciliation as a child)	0 (reconciled parent)
Total	60		

Looking back at the 1970s, including evaluations among the selected authors and critics that appeared before 1970, the number of bi-directional arcs is quite low. No more than 60 fairytale role ties have been found (see Table 1) because most ties consist of unilateral evaluations by reviewers on authors. The reciprocal positive and negative ties are more common (circa 20 instances of each type), which may be a result of a tendency toward balance. Note that one type of ordered tie, reacting positively to a negative action, is not covered in the fairytale. Figure 2 displays the network of fairytale role ties. Vertex color represents an author's literary style (note that donor ties often appear among members of the same style group whereas failed donor ties appear only once among them); critics are drawn as white vertices. Provided that an SVG plug-in has been installed on your web browser from http://www.adobe.com/svg/viewer/install/, clicking http://tinyurl.com/nqelt or http://repositories.cdlib.org/cgi/viewcontent.cgi?filename=1&article=1034&context=imbs/socdyn/sdeas&type=additional opens this picture as a Scalable Vector Graphics image in which the types of ties can be turned on and off interactively, e.g., all but the dotted ties can be turned off to see the location of negative ties, and similarly for donor ties or parent/ungrateful child ties.

Since all ties are rather scarce, authors or critics do not accumulate many instances of a particular fairytale role tie; usually they have less than three. However, there is one exception. One critic, Kees Fens, collected no less than six ties of the parent with ungrateful children type, whereas no other author or critic received more than one (open the SVG version of Figure 2 and deselect all but the red ties). Interestingly, this critic belonged to an older literary generation than most of the authors and critics in the sample. In addition, he decided to quit reviewing contemporary prose near the end of the investigated period. In this instance, a person's attribute – seniority – combines with a particular fairytale role tie that is linked to the parent role, culminating in an event that is semantically related to both, namely, retirement. Here, the type of tie seems to be associated with the cultural meaning it has in the fairytale model.

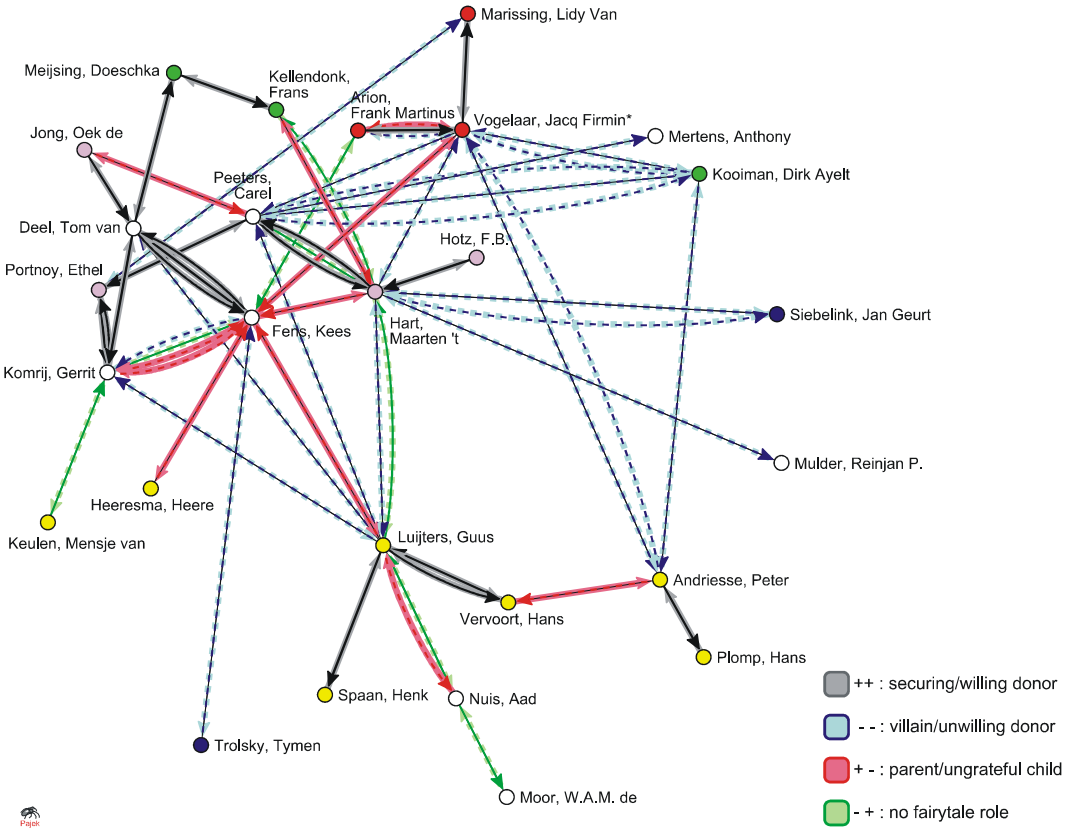

Figure 2 - Fairytale role ties in the literary criticism network (click http://tinyurl.com/nqelt to obtain interactive SVG).

Notwithstanding this example, being involved in a particular type of tie is never strongly associated with social attributes of the author or critic involved. The weak associations found (uncertainty coefficients predicting the occurrence of a particular tie ranging between 0.15 and 0.25) involve unbalanced ties only. Authors and critics from lower class origins and/or with parents having non-cultural jobs are slightly more likely to receive negative judgment from people whom they evaluated positively (uncertainty coefficients 0.17 and 0.16) and they are more likely to evaluate favorably authors or critics that passed negative judgment on them (0.22 and 0.18). This is probably due to status deference mechanisms and it does not make sense to expect a typical parent role in their case.

There is also a weak association between literary seniority and having a particular fairytale role tie. The oldest generation, who made their appearance before 1970, is slightly more likely than younger generations to pass positive judgment on an author or critic by whom s/he was evaluated negatively (0.17). Although hurt by their "children," they continue to cherish and support them. Finally, critics are relatively often recipients but not senders of -+ ties (0.21), indicating that they more often start

ties with negative evaluations than authors. As critics, they often pass judgment first because they must review new books and, being critics, their judgments are not solely positive. This may be regarded as an effect of a predefined institutional role. Thus, they are predisposed to act as villains, which may be the reason for authors to reproach them of being frustrated authors at times.

Considering the general tendency of critics to pass negative judgment first, the many positive first evaluations passed by one critic mark him as atypical of the rest. In combination with his seniority, this may have stimulated authors and other critics to associate him with the typical role of the elder that must be "disobeyed" in order to advance one's own career. And he gave way to the new generation.

These results support the idea that people, even in a professional context like the literary field, attach meanings to temporally ordered ties according to the fairytale roles. Especially the unbalanced ties seem to be meaningful because they are related to social attributes of the actors, esp. literary seniority and social class. In contrast to Leifer's assumptions, even slight or minor differences between peers matter. Perhaps a more Bourdieuan perspective claiming that people will always look for differences to make a difference (Bourdieu 1986) is to be preferred over a model abstracting from social characteristics. Meanings clearly coincide with the fairytale role connotation only in a single case where one person collects remarkably many ties of one kind; when it results from collective action.

Scripts as nested action

In spite of its title, Propp's *Morphology of the Folktale* is not strictly a morphology. It contains syntactical elements as well, notably the statement that functions appear in a strict order. In this respect, the morphology may be useful for further specification of the *stereotyped stories* that guide actors' behaviors (White 1993: 194). Do fairytales offer scripts for action or grammars for constructing stories about action?

Unfortunately, we cannot translate Propp's fixed order into a fixed sequence of fairytale role ties for sequence analysis (Abbott 1995) or for constructing Markov chains specifying transition probabilities between fairytale role ties. Even blockmodeling (Borgatti and Everett 1992) does not seem to offer a simple solution to the problem of how to analyze the temporal order of the tales' structure. There are two reasons for this.

First, Propp states that not all functions and characters necessarily appear and if they appear, they may even appear repeatedly (trebling). As a consequence, it is quite difficult to predict the next function that will occur in the tale and the total number of

functions in a tale. Second and more important, tales may contain several *moves* (plots), which are either sequentially ordered or nested (subplots). With two or more sequentially ordered moves in a story, any function may precede any other function in the story even when they are in fixed order within each move. If almost any sequence is possible, then sequence analysis fails and transition probabilities will not yield a clear pattern.

The demarcation of moves, however, is not straightforward if one abstracts from character attributes and connecting events that are peculiar to fairytales, especially when moves are nested. In applications to social networks, detecting sequences is further complicated by the fact that most social settings do not have a clear beginning and ending. Instead of analyzing sequences, I propose to investigate the nesting of fairytale role ties. It is possible to formulate a simple nesting rule, which covers almost all of Propp's stipulations about the order of functions and the combination of plots as I have translated them into temporally ordered signed ties (fairytale roles). The nesting rule is:

> A fairytale role tie must end within any fairytale role tie in which it starts and it must start within any fairytale role tie within which it ends.

In this rule, a fairytale role tie is considered to start within another fairytale role tie if its first action occurs in between the first and second action of the other fairytale role tie. Similarly, it ends within another fairytale role tie if its second action occurs in between the first and second action of the other fairytale role tie.

To show that the nesting rule covers Propp's ideas about order in my formalization of story structure, I must first translate Propp's order into four criteria for stories as temporally ordered signed networks.

1. If donor, villain, or parent role ties (from disobedience to making up for the disobedience) appear in one move, then they are always correctly nested (in the sense of the nesting rule) in the following order: donor role tie within villain role tie within parent role tie.

This nesting reflects the order of the functions associated with the donor, villain, and parent role as specified in Propp's Chapter III. The fairytale role ties as I have defined them in a previous section incorporate the pairing and ordering of the associated functions within a move according to Propp. Note that I disregard functions that are not associated with the defined fairytale role ties.

2. Within a move, fairytale role ties that occur more than once (trebling) are sequentially ordered.

Propp (1968: 74-75) discusses the trebling of functions, function pairs, or groups of functions. Although he does not state this explicitly, I infer from his examples that trebling means repeating one group of functions after the other without overlap as in the trebling of the donor role in the swan-geese example.

3. Any fairytale role tie may define a move, that is, its first act may signal the beginning of a new move and its second/last act may signal the end of a move.

Propp (1968: 53, 58, 92) states that each instance of villainy and each new lack creates a new move. In his example of liquidating a lack as a distinct move, Propp uses the functions formalized as a (successful) donor role tie for delineating a move (Propp 1968: 94-95, example 4). This suggests that securing the help of a donor may count as a move. For the sake of simplicity, I extend this to unsuccessful donor role ties. Finally, since the first part of the parent role, disobedience, is part of the initial phase of a move and the second part, making up to the parents, is in the final phase, it seems quite logical to conclude that these two parts together may define a move. As a result, all four defined fairytale role ties may delineate a move

4. Moves may be ordered linearly or nested integrally, that is, the nested move is completed before the story returns to the previous (nesting) move.

Propp (1968: 92-96) presents six ways in which moves can be combined in a story. My statement clearly covers types 1 (linear coordination) and 2 (simple nesting). Type 3 is also covered if we regard it as multiple nesting, assuming that move III is nested within move II, which is nested within move I, but move III is not a continuation of move I as Propp's diagram may suggest. Type 4, referring to two villainies occurring simultaneously followed by the liquidation of the two moves one after the other, is an instance of simple nesting if we assume that the order of the two initial villainies is irrelevant. Types 5 and 6 – moves with a common ending – may or may not obey the criterion of integral nesting, depending on the order of functions in the common ending. Here, my criterion may be stricter than Propp's, which could be tested on his corpus of tales. Propp's Example 6 (1968: 131), however, suggests that the move that is nested more deeply is completed first.

With these criteria, it is easy to show that the nesting rule covers all combinations of fairytale role ties that are allowed by the criteria. In a single move, all fairytale role ties are nested or ordered linearly (in the case of trebling) by criteria 1 and 2, so both situations taken apart satisfy the nesting rule. Trebling a nested structure means repeating the nested structure, so the nesting within each instance remains intact and nesting of different instances cannot overlap, excluding the possibility that they overlap and are not nested correctly. The final possibility, trebling within a nested structure, occurs when a role tie is repeated between opening and ending acts of the

nesting fairytale role tie, so a trebled fairytale role tie always starts after these opening acts and ends before the closing acts of the nesting role tie. Therefore, it cannot end within another role tie than the one in which it started and vice versa, so it cannot be nesting incorrectly.

If fairytale role ties are nested correctly within a single move, then they are nested correctly also in any linear combination of moves because appending one move to another does not induce new instances of nesting. Similarly, the integral nesting of an entire move within a new move yields only correct instances of nesting, because each role tie within the nested move is completed before the story returns to the nesting move (criterion 4), so all role ties of the nested move start and end within any role tie that was opened but not yet closed in the nesting move at the time the nested move commenced. We may conclude that any story satisfying the criteria specified above will comply with the nesting rule.

It is even easier to see that the nesting rule covers no other story structure than the combinations of fairytale role ties allowed by the four criteria. In other words, any instance of correct nesting can be identified as a correct fairytale according to the specified assumptions. First, in a correctly nested structure of fairytale role ties, any pair of linearly ordered fairytale role ties may be either interpreted as two separate moves, since any fairytale role tie may define a move (criterion 3) or as a case of trebling (criterion 2). Second, in a correctly nested structure of fairytale role ties, any pair of nested ties may be interpreted either as the internal structure of one move if the nesting conforms to assumption 1 or it may be seen as the integral nesting of a move within another move, since any fairytale role tie may define a move (see assumption 3). This concludes the proof that the nesting rule only yields structures that comply with the criteria.

The nesting rule bears some resemblance to the type of rules developed in transformational grammars for natural languages. Although some have argued against transferring grammars for the structure of sentences to grammars for the structure of stories (e.g., Wilensky 1982), a focus on nesting and repetition seems to be very fruitful. A previous analysis of Eskimo folktales inspired by Propp's morphology arrives at a transformational story grammar that is both elegant and powerful (Colby 1973). Some of Colby's results are quite in line with the nesting rule proposed above, e.g., each move in the Eskimo folktales contains a Motivation – Engagement – Resolution (M – E – R) sequence, in which E – R sequences can be nested or repeated. Villainy or lack in Propp's sense is often part of the motivation, donors appear in the engagement section, and victory over the villain is a typical form of resolution (Colby 1973: 646-650). This suggests that the Eskimo folktales, if

formalized as temporary ordered signed networks, will comply with the nesting rule formulated above.

Nesting in a social network

In the previous section, a formal rule was derived that tests Propp's assumptions about the sequence of functions in Russian fairytales if these are represented as dynamic networks of actors that act positively or negatively towards one another. Can we apply this formal model to social networks as we did with the fairytale roles? Do people pattern their interaction according to the nesting rule that they may have learned from fairytales, e.g., securing the help of a donor before retaliating a villainy?

I will attempt to answer this question using the same network of literary critics and authors analyzed in a previous section, using the fairytale roles that were identified there. The parent – child couple may contain three acts, that is, two successive pairs of acts, but I have looked only at the second pair (disobedience – reconciliation) because Propp does not discuss the first pair. Having identified the fairytale role ties, each pair of ties in the social network involving at least one common author or critic, may be classified either as sequential, as correctly nested, or as incorrectly nested according to the nesting rule.

Table 2 - Frequencies of correctly and incorrectly nested fairytale role ties.

	donor failed		donor secured		Villain		parent*	
	correct	incorrect	correct	Incorrect	correct	incorrect	correct	incorrect
donor failed	5	2	2	4	1	1	0	0
donor secured	2	3	1	0	0	1	0	0
villain	3	3	1	3	6	1	0	0
parent*	0	0	0	0	0	0	0	0

Row tie is correctly or incorrectly nested within column tie.
* Disobedience – reconciliation.

Table 2 shows the results of correct and incorrect nesting. There are only a few more instances of correct (21) than incorrect nesting (18), so there is not a clear tendency toward correct nesting in the network. In particular, the nesting of the securing a donor tie within a villainy tie, which is characteristic of fairytales, does not occur at all (see the intersection of the donor secured row with the villain/correct column in Table 2).

Most correct instances of nesting (15 out of 21) involve only failed donor and villain role-pairs, which are predominantly nested within the same type (11 out of 15).

Reciprocal negative evaluations seem to be nested regularly, whereas sequential ordering of villainies does not appear (Table 3). Authors and critics tend to handle negative evaluations in reverse order: react to the last one before handling previous ones. When the scores are settled, no new negative evaluations are received or negative evaluations are not countered anymore. This procedure evokes the image that the hero is suffering from a concerted attack to which he is eventually obliged to respond: *noblesse oblige*. Perhaps it is an example of an action strategy that attaches status (nobility) to the negative action of criticizing peers in Leifer's sense (Leifer 1988). If so, it is more likely to be learned from chivalric literature than from fairytales.

Conversely, positive reciprocal ties (donor secured role) are relatively often ordered sequentially, that is, they precede other ties. Table 3 lists the instances of linear ordering of role-pairs: a role tie starting after the completion of another role tie. The donor secured row of this table shows that a completed donor secured tie is followed by a donor failed tie, a donor secured tie, and a villain role tie three times. Mutual praise is linearly ordered rather than nested. It is important to establish donors at short term.

Table 3 - Frequencies of sequential ordering of fairytale role ties.

	donor failed	donor secured	villain	parent*
donor failed	1	1	2	0
donor secured	3	3	3	0
Villain	1	1	0	0
parent*	0	0	0	0

Row tie is directly followed by column tie.
* Disobedience – reconciliation.

Conclusion

This paper investigated the relations between the structure of stories, that is, fairytales, and social structure, assuming that stories offer dynamic models of affective relations that people use as templates of roles and scripts in their lives. To investigate this function of fairytales, elements of the general structure of Russian fairytales proposed by Vladímir Propp have been formalized as patterns of temporally ordered signed ties. It turns out that Propp's basic structure can be formalized elegantly, yielding results that are intuitive and that can be applied to any type of signed network.

It is important to note that the formalization developed here is of a different nature than previous applications of network analysis to stories (Bearman and Stovel 2000)

and newspaper contents (Franzosi 2004). In these applications, relational models are built that represent the semantic categories in the stories and newspapers in ways that are comparable to map analysis (Carley 1993, 1994). In contrast, the fairytale roles model attaches meaning to non-semantic events, viz., the temporally ordered pattern of positive or negative actions between two actors. To put the difference bluntly, the previous approaches remain in the semantic universe of meanings whereas this paper links the semantic universe to the realm of interaction.

This is not to say that the two perspectives cannot be linked. After all, the fairytale roles model stems from an analysis of stories. It is quite evident that the main events in Bearman and Stovel's analysis of stories on how people became Nazis bear close resemblance to the main events in Russian fairytales: breaking away from the family as the traditional source of identity is crucial to becoming a Nazi and it starts the action in the fairytale. High mobility of Nazis parallels the quest undertaken by the fairytale's hero. To some scholars, fairytales represent the transition from the parental home to another home, e.g., in connection to marriage. Perhaps we should look beyond this theme to find a culturally determined account for life histories and other series of past events.

I hypothesize that the Nazis may have selected facts, events and interactions from their histories in order to obtain a story that matches the structure of fairytales in order to make sense of what happened and to be the hero of the story in the end. Therefore, this paper's result that the sequence of functions in fairytales, which was shown to be equal to a nesting rule for interactions, did not emerge in the empirical network of evaluations among literary authors and critics, may not come as a surprise. It is in the accounts of interaction rather than in the interaction itself that people apply stereotyped stories as scripts. Thus, scripts from stories function both as a mnemonic device and as an instrument to produce meaning because they assign stereotyped (fairytale) roles and connotations to actors. This is probably the true meaning of Harrison White's conjecture that social structure should be seen as "the interlocking of *stereotyped stories* that actors proffer and through which they perceive and perform and maneuver" (White 1993: 194).

Although the types of nesting characteristic of fairytales have not been found in the social network, some types of fairytale roles turned out to be regularly nested or sequentially ordered. In this case, the nesting rule pinpoints regularities in decisions on when to respond to previous actions. It is my conjecture that this rule will prove to be a helpful instrument for analyzing the temporal organization of dynamic group process. For instance, the investigation of turn-taking by David Gibson (Gibson 2005), who focuses exclusively on the direct succession of speakers, may benefit

from applying the nesting rule to the dynamic ties of each speaker. When does a person address a person who has addressed him or her before? If the coded contents of the message are taken into account, e.g., as agreement or disagreement, fairytale roles may also appear here. At the same time, my elaboration of additional fairytale roles, viz., the roles that include three actors, such as the false hero, king and princess, will benefit from Gibson's typology of the threesome: previous – current – next speaker.

The most important result presented in this paper is the discovery that archetypical roles in fairytales can be identified by particular sequences of interaction (ties). Fairytales and other stories attach cultural meaning to dynamic ties. In this way, stories provide the link between structural roles as relational constructs and social roles as mental constructs. This finding expands the work by Eric Leifer on the ways in which people obtain roles through interaction in settings without predefined social roles (Leifer 1988). The fairytale roles model fills two gaps in Leifer's account. First, it offers a set of possible roles from which actors may choose, which are left unspecified by Leifer, and where they come from (fairytales and possibly other stories). Second, my model explains which roles confer status and which do not, which is left open by Leifer. It is the function of fairytales to attach positive connotations to some roles and negative connotations to others.

Some evidence was found that people act according to the fairytale meaning of dynamic ties in a literary network. Most prominently, one critic developed ties that characterize the parent role and finally adopted the behavior associated with the older generation, viz., retirement. The case suggests, however, that personal attributes must match the cultural meaning of the structural role for this to happen. This contradicts a basic assumption in Leifer's theory, which abstracts from all social differences between actors because they have all passed the same institutional selection procedures. Differences remain, however small they are, and people tend to use any difference in order to make a difference (Bourdieu), so they are likely to be used when people sort each other into social roles.

Finally, all fairytale roles show a high degree of balance and they evolve toward balance. This underlines the conjecture that stories function as models of balance. It is plausible that fairytales are among those genres that instill a longing for balanced affective relations into children's minds, which may explain the general tendency toward balance in interpersonal relations in the Western world as noted by Fritz Heider in his original balance theory (Heider 1958). Then we can understand why reciprocity, which is a balanced tie in a signed network, acts as a generalized norm. However, we should not assume that this is a universal aspect of human culture. Do

other types of stories violate the principle of balance, e.g., current TV show formats and computer games, and do we encounter the same balanced dynamic role ties in folk stories from other cultures?

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