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▶ **To cite this version:**

Jean-Louis Dessalles. Conversational topic connectedness predicted by Simplicity Theory. 39th Annual Conference of the Cognitive Science Society, Jul 2017, London, United Kingdom. pp.1914-1919. hal-03814068

**HAL Id: hal-03814068**

**https://telecom-paris.hal.science/hal-03814068**

Submitted on 18 Oct 2022

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# Conversational topic connectedness predicted by Simplicity Theory

**Jean-Louis Dessalles (dessalles@telecom-paristech.fr)**
LTCI, Telecom ParisTech, Université Paris-Saclay
Paris, France

**Abstract**

People avoid changing subject abruptly during conversation. There are reasons to think that this constraint is more than a social convention and is deeply rooted in our cognition. We show here that the phenomenon of topic connectedness is an expected consequence of the maximization of unexpectedness and that it is predicted by Simplicity Theory.

**Keywords:** Conversation, topic change, simplicity, unexpectedness, interestingness.

## Introduction

A few decades ago, attempts were made to understand how and why conversational topics are almost systematically connected to each other, while abrupt topic shifts are avoided or even socially repressed. Jerry Hobbs (1990), for instance, describes several connection patterns that topics must respect to come next to each other in conversation and he wonders whether these mechanisms are due to cognitive constraints or are mere social conventions. The constraint of topic connectedness is so strong that abrupt topic change is classically considered characteristic of pathological conversation. The inability to respect topic connectedness during conversation has been for instance described in autism (Hale & Tager-Flusberg, 2005; Volden *et al.*, 1997) and in schizophrenia (Harrow *et al.*, 1983). Even in these conditions, it is not clear whether patients merely ignore the constraint or still respect it covertly. The latter possibility would result from the patients' inability to realize that some elements needed for connecting topics lie only in their mind and have not been made public (Harrow *et al.*, 1983).

Though authors had an intuition about what a conversational topic is and about how an utterance can be appropriate, the lack of proper definitions made the problem of topic connectedness difficult to address formally. When commenting on his maxim 'be relevant', Grice wonders

> *"what different kinds and focuses of relevance there may be, how these shift in the course of a talk exchange, how to allow for the fact that subjects of conversation are legitimately changed, and so on. I find the treatment of such questions exceedingly difficult" (Grice, 1975).*

Conversation has often been described either at the surface level, with notions like repairs and adjacency pairs, or at the sociological level, with notions like involvement, face preservation or gender talk. The present study adopts a rather different perspective, a *cognitive* one. The point is to show that the problem of topic connectedness can be derived as a natural consequence of conversational mechanisms operating at the cognitive level.

The remainder of the text starts by making a distinction between two fundamentally different conversational modes: narratives and argumentative discussions. The way narratives connect to each other is particularly intriguing. We will observe patterns of topic connection using data taken from a corpus of spontaneous conversations. I will then introduce the Simplicity Theory (ST) framework and show how it can be used to explain the topic connectedness phenomenon.

## Conversational Topics

For long, it was hardly possible to study spontaneous conversations by making any hypotheses beyond what could be objectively observed. No assumptions were made about the participants' beliefs or desires. As a consequence, the existence of two sharply contrasted conversation modes, *narratives* and *argumentative discussions*, was considered unimportant. Though these two modes may be observed in pure form during conversations, they are sometimes intertwined, making the distinction less apparent at the surface level. If one takes a cognitive perspective, however, the distinction cannot be overlooked. The first explicit description of the narrative/argumentation dichotomy was apparently given by Jerome Bruner (1986), though many authors (*e.g.* Sacks, 1992; Tannen, 1984; Eggins & Slade, 1997) implicitly distinguished between stories and other forms of verbal interaction.

### Conversational stories

People tell stories during conversations, *i.e.* they mention past events that are supposed to have occurred. Despite early studies (Sacks, 1992; Labov & Fanshel, 1977:105; Polanyi, 1979; Tannen, 1984), the importance of the phenomenon has rarely been acknowledged until more recently (Norrick, 2000), as it only occurs among people who are already acquainted and is absent from most corpora recorded in the lab. Typical conversational narratives are easy to recognize. They are most often about past events (the past tense is used in English) for which the four w's (*when*, *where*, *what*, *who*) get instantiated. Consider the following conversation from my corpus. It involves two French women who had some trouble buying butter ('beurre' in French) during their stay in Spain [translated from French].

D: […] she was with her cousin in Spain. And so… they wanted to buy butter. And then [laugh] her cousin said to her, she didn't speak one word of Spanish, but she said to her: "I can speak Italian; Italian and Spanish, that's the same", and then
O: Oh là là! Oh là là!
D: So she enters the store, and she says 'Burro'. And then [laugh] then everyone was staring at her, and so 'burro' means 'donkey'.
O: Oh! [laugh]. It means 'donkey'! She wanted to say 'Butter'! Burro. [laugh] It plays tricks, isn't it?

This story is definitely reporting a situated event: the 'when', 'where', 'what', 'who' are supposed to be constants and not variables. However, being situated is not sufficient for an event to be worth telling.

> "if you come home and report what the grass looked like along the way, that there were four noticeable shades of green some of which appeared just yesterday because of the rain, then there may well some tightening up on the part a your recipient. And if you were to do it routinely, then people might figure that there's something odd about you" (Sacks 1992:219)

> "We would intuitively reject such introductions as 'Let me tell you something ordinary that happened yesterday…' A narrative that is in fact judged to be ordinary may be rejected after it is told by expressions equivalent to 'So what!'" (Labov & Fanshel 1977:105)

The missing ingredient that is required to turn an event into a story has been informally described by several authors in similar terms: narratable events should be 'problematic' (Ochs *et al.*, 1992), 'different from ordinary experience' (Labov & Fanshel 1977:105), 'unexpected, deviant, extra-ordinary, or unpredictable' (van Dijk, 1993), 'abnormal' (Schank, 1979), 'odd or unexpected',' rare', 'impossible or unheard of', be 'the violation of a norm' (Polanyi, 1979), 'depart from expectations', be a low probability event (Agar, 2005). The 'burro' story above definitely matches many of these criteria. We will subsume all these properties by saying that an event must be *unexpected* to be storyworthy. This notion will be refined below.

Languages offer means to emphasize unexpectedness, ranging from adjectives like *odd*, *funny* to specific markers like the *wo* particle in Cantonese (Luke 1990). Unexpectedness is the key element that controls storyworthiness. Emotional events are of course interesting, but happy or tragic situations do not arouse emotion unless they are unexpected (Saillenfest & Dessalles, 2012). We will see that the unexpectedness requirement is also the very reason why narrative topics are connected.

## Argumentative discussion

A significant amount of conversational time is devoted to an activity that radically differs from story telling, namely argumentative discussion. The argumentative mode seems to be the prevalent one, at least in my corpus of family conversations. During an argumentative discussion, people deal with *problems*, *i.e.* incompatibilities between beliefs and/or desires[1]. The following conversation deals with TV and radio power consumption (translated from French).

P- When you put it into standby mode using the remote control with the small red dot on.
L- mmm
P- Does the TV remain switched on?
L- Yes.
P- So it is to be avoided,
L- No.
P- leaving it that way permanently?
L- No. People would say yes, but, it is quite irritating; you don't take advantage of having a remote control, and, uh, I mean, you will save six month or one year on the TV's life expectancy. Pff.
D- [to P] Not at all. And anyway, it sets…, it damages tubes a lot to set them on and off.
L- No but anyway, the tube is switched off when you put in standby mode.
D- I don't think so.
L- No, one should not compare consumer electronics and professional tubes.
D- Because, still, when you [really] switch it on, you can hear quite a discharge.
L- Yes, well, the tube warms up. When you put it…, No, no, the tube is switched off, but because it is consumer electronics, uh, otherwise you burn the tube, if it is consumer electronics.
O- A totally unrelated issue: when I put, I leave my radio plugged in, knowing that it is also a cassette recorder,
L- Yes.
O- I can hear something. […] Should I switch… should I pull off the plug each time or it cannot damage the engine.

The problem here is the apparent incompatibility between the standby mode and the wish to keep the TV undamaged (the last utterances show the transition to the next topic). Discussions function as consistency maintaining devices: participants point to an incompatibility (like standby mode *vs.* no damage) or try to resolve a previously mentioned incompatibility.

## What counts as a topic?

Based on the argumentative/narrative dichotomy, the notion of *topic* can receive a proper definition.

- The topic of a narrative is the unexpected event it refers to.
- The topic of an argumentative discussion is the logical inconsistency that motivates it.

One could be tempted to consider that stories and argumentation are just two extremes in a continuum. An utterance like (talking about a toddler) "She is going down the stairs by herself!" might seem hard to classify either as narrative or as argumentative, as the event is both unexpected and potentially problematic (the child may fall down). And how would this injunction to a child: "Don't touch it!" or an exclamation like "Oh, that's wonderful!" be classified? There are reasons, though, to stick to the narrative *vs.* argumentation dichotomy. The most important one comes from the conviction that human conversational behaviour cannot be based on a wide gamut of unrelated cognitive devices. The narrative competence, as described by Simplicity Theory (see below), and the argumentative competence, as described in a minimal way in (Dessalles, 2016) can account for the relevance of most conversational utterances.

The crucial element that helps decide in which mode we are is *negation*. If the speaker has the negation of the state of affairs in mind (the child [should] *not* go down the stairs by herself; the child should *not* touch the object), then the

[1] The word 'argumentation' in English sometimes conveys an idea of dispute or may refer to situations in which some individual tries to convince another. We do not consider such restrictions.

move is argumentative; if the event is regarded as unexpected, it is a narrative move[2].

## Topic shift and topic drift

Respecting transitions between conversational topics seems almost as important as making appropriate moves.

> Not only are there socially sanctioned rules for appropriate topics of conversation, but also, in the course of a conversation, it is impolite to make an abrupt change of topic even to another socially sanctioned topic. To make a change of topic one must usually create some link to the previous topic, or one must drift to another topic in a stepwise fashion. (Shiller 1995:184)

Hobbs (1990) identified several patterns through which successive topics connect to each other. One of them is 'semantic parallelism'. Two topics may share a common predicate $p$ applied to different (but similar) arguments $a_1$ and $a_2$: $p(a_1)$ and $p(a_2)$. For instance, two stories about an accident share this common feature, though the different roles (driver, victim…) would differ. Conversely, two stories may be connected by an argument instead of by the predicate: $p_1(a)$ and $p_2(a)$, *e.g.* if successive stories involve a same protagonist.

Hobbs then considers connections that apply to argumentative discussions. It is often artificial to talk about topic change in argumentative discussion. Hobbs prefers to talk about topic *drift*. Since argumentative discussions go around problems (*i.e.* logical inconsistencies between beliefs and/or desires), a solution to a previous problematic issue may be regarded itself as problematic. This may lead to topic drift: People stack problematic topics on top on each other, and may or may not revert to a previous one. When there is a 'main issue', the topic can be clearly identified. For instance, in my main corpus of French conversation, one discussion about preparing a meal that would suit North American visitors consists of 255 utterances and lasts for twenty minutes. In many cases, however, discussions drift with no intent to reconsider the initial issue.

## Observing topic shifts

Stories tend to cling to each other, forming what Deborah Tannen (1984:100) calls *story rounds*. During a conversation among friends, she counted 48 narratives, 21 of which where told in five rounds: two stories about sex differences for language learning, five stories about adopted children, five about summer camps, five about strange accidents and four about child discovery of sexuality. The 'burro' story (see above) is part of a story round as well. This story round in detailed in Table 1. Transitions between topics (here, association or analogy) are shown.

As mentioned above, argumentative discussions tend to drift through logical connections. However, in some cases, discussions can be connected to each other in much the same way as narratives. Table 2 shows an example of what we may call *argumentation rounds*. The above discussion about the TV in standby mode is included in this round. Note that a story is embedded in this sequence, as it is used as an argument (independently from its unexpected character that makes it a story in its own right).

Table 1: Example of story round

| | |
|---|---|
| L compliments his mother on the salad dressing she made [19 sec.] | |
| P tells a story that happened during a group travel in Italy. Salad was served without dressing in restaurants, and one had to dress it for the whole group. P tells the extreme contrast in the quantities of oil and vinegar depending on who did the dressing, and the ensuing frictions within the group [207 sec.] | association |
| Discussion about cheese [118 sec.] | association |
| P tells another story about the same trip in Italy. Two members of the group tried to ask for more milk at breakfast, trying to say milk in various languages (French, English, Latin), without success, until one of them said 'moo' ("*meuh*" in French) [44 sec.] | analogy |
| L tells how people looked at him with puzzlement as he merely tried to ask the way by giving his hotel address during his recent trip in Italy [52 sec.] | |
| D tells a story about word confusion during a trip in Spain. The two friends wanted to buy butter. One of them tried the Italian word 'burro', claiming that the two languages were close enough. But 'burro' means donkey in Spanish [44 sec.] | analogy |
| L remembers that a friend prepared a dish of spaghetti for L and D. The recipe was called 'doppio burro'. [16 sec.] | association |
| P tells a story about having complimented two German friends on their dresses using a German word that sounds like an insult in French [100 sec.] | analogy |

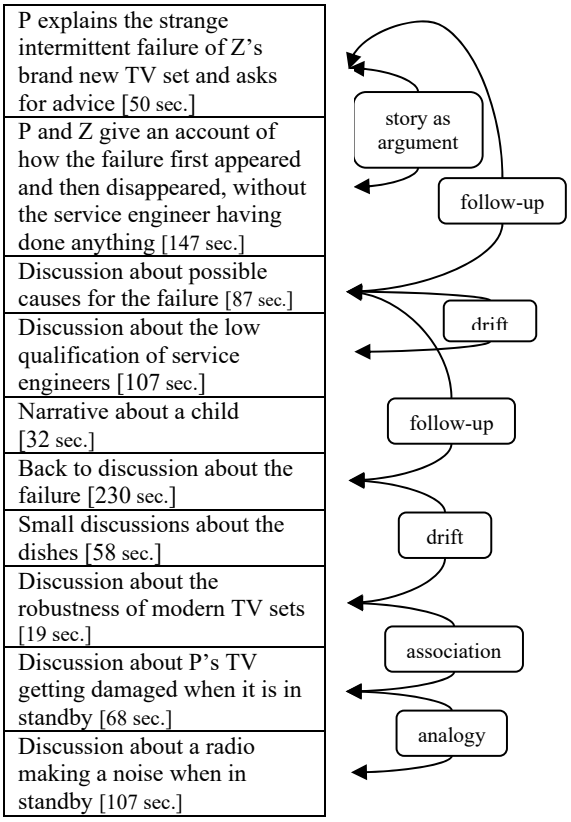
It is interesting to observe the different categories of topic transition, as they are described for instance in (Hobbs, 1990), at work in real conversations. The point is not to make precise quantitative assessments, as we expect significant variance depending on the kind of corpus we observe (number and age of participants, degree of acquaintance, situation and so on). Rather, we would like to get just some rough idea of the relative importance of the different forms of topic connections.

The corpus chosen here is a set of conversations recorded during family gatherings during three years. The total duration is 17h50min. Participants are mostly the same

[2] Note that speaker and hearer may adopt different attitudes, *e.g.* if the latter proposes a solution (go and grab the child) to what was a 'look at this!' utterance.

across recordings. In order to avoid selection bias, a sampling method has been used. Two-minute long slices were selected around 139 randomly defined time locations. 8 of these slices were ignored as no one was talking at the central time. 18 more were discarded as unintelligible. Reasons for unintelligibility are multiple and include noises, simultaneous loud conversations and child screams. The 113 remaining excerpts can be classified as shown in Table 3.

Table 2: Example of argumentation round




Several comments have to be made about these results. The main observation is that very few topics are introduced out of the blue in this kind of corpus. This may suggest that the number of abrupt topic change observed in other corpora (*e.g.* Nordenstam, 1992) might be overestimated, either because some crucial connecting piece of knowledge might be unknown to the external observers, or because conversations elicited in the lab might lack the spontaneous aspect of normal conversation.

Almost any connection seems possible between narratives (the term 'signal' refers to mentions of unexpected events that are 'here and now'[3]). The most represented topic connection in this corpus is analogy, which means that these narratives occurred in typical story rounds. The connection might be less tight, as when only one element is common with the parent topic.

[3] One such signalled event is a news about the near future. It is listed as 'narrative', though narratives are typically about past events.

Another observation is that the most basic pattern: problem–solution or solution–problem, is the majority argumentative connection but is not the only one. Problems may also refer to the current situation (*e.g.* I am missing a fork) or to an element from a preceding narrative. Surprisingly, a problem may also refer to another problem. This occurs in a problem-solution-problem-problem pattern, in which the last problem suggests that *not* adopting the solution is a problem as well (see (Dessalles, 2016) for a minimal model of relevant argument generation).

Table 3: Topic shift counts

| | Topic type | Link with parent topic | # / 113 |
|---|---|---|---|
| Argumentation | Problem | *None* | 1 |
| | Problem | Situation | 12 |
| | Problem | solution, refutation | 13 |
| | Problem | Problem | 6 |
| | Problem | Narrative | 3 |
| | Solution | Problem | 33 |
| Narratives | Signal | Situation | 14 |
| | Narrative | *None* | 3 |
| | Narrative | Situation | 2 |
| | Narrative | Temporal | 1 |
| | Narrative | Common item | 4 |
| | Narrative | Close association | 3 |
| | Narrative | Analogy | 13 |
| | Narrative | Problem | 1 |
| | Narrative | Explanation, refutation, solution | 4 |

## Explaining topic connectedness

In this section, we go beyond description and ask why conversation topics are so systematically connected. The suggestion will be that topic connectedness is the expected outcome of the quest for unexpectedness and that it is predicted by Simplicity Theory.

### Simplicity Theory

Simplicity Theory (ST) has been developed to explain event narratability. As discussed above, the core notion is *unexpectedness*: events must be unexpected to be tellable, and conversely unexpected events are systematically tellable. The notion of unexpectedness is not intrinsic to the event. It depends on the observer and on the current context. Previous attempts to define unexpectedness as 'low probability' failed to incorporate this necessary relation to the context.

ST is based on the notion of abnormal simplicity. Imagine that the numbers 1, 2, 3, 4, 5 and 6 are drawn in the National Lottery. Tough the probability of this outcome is exactly the same as for any other draw, the news would be considerably more thrilling. Intuitively, the consecutive draw is interesting because it is abnormally simple. Simplicity is

obvious here as the sequence 1, 2, 3, 4, 5, 6 is *compressible*. The underlying theoretical notion is a cognitive (*i.e.* resource-bounded) version of Kolmogorov complexity[4]. Complexity here means 'minimal description length'. 1, 2, 3, 4, 5, 6 can be described using a much shorter code than a 'normal' draw like 3, 17, 27, 28, 33, 45. The consecutive draw can be described using the 'increment' operation, which is one of the simplest operations in the context of numbers, whereas the 'normal' draw cannot be 'compressed' down to a shorted description than itself.

Unexpectedness (or abnormal simplicity) $U$ results from a contrast between *causal* complexity $C_w$ (the circumstances or choice points that brought the event to happen) and *description* complexity $C$. Formally:

$$U = C_w - C. \quad (1)$$

Though ST was initially developed to account for specific situations such as lottery draws or coincidences, we were surprised to find that the complexity drop between causality and description generalizes to all narratable situations (Dessalles, 2008). For instance, a fortuitous encounter is all the more narratable as the place of the encounter is complex (or hard to reach) and the encountered person is simple (a close acquaintance or a celebrity). The former parameter (location remoteness) controls the causal complexity, while the latter (minimal description of the person) controls the description complexity (see www.simplicitytheory.science for further examples). ST also accounts for problems underlying argumentative topics: the intensity of the problem corresponds to a high value of causal complexity $C_w$ (Dessalles, 2013).

Simplicity Theory accounts for many aspects of interestingness that are left otherwise unexplained. It explains why recent events are more interesting if they are closer in time and space, why 'round' anniversaries (after exactly 1, 10 or 100 years) make past events worth talking about, why mishaps concerning celebrities might be as interesting for certain audiences as if they concerned own family, why people are fond of exceptions, norm-breaking behaviour and record-breaking performances, why collectors value items that are remarkable due to a simple feature (*e.g.* an inverted image on a stamp), and so on. All these predictions are derived from the equation $U = C_w - C$ (Dessalles, 2008; 2013; Saillenfest & Dessalles, 2015; see www.simplicitytheory.science).

## Context and simplicity

Context plays a prominent role in the phenomenon of topic connectedness. ST not only defines this role, but also defines what the context *is*. In ST's framework, the context is defined as the set of properties that contribute to making the event unexpected. Formally, such properties can be written as:

$$f(s, c_1, c_2, \ldots),$$

where $s$ is the event, $f$ is a predicate and $c_i$ are constants. Note that a property may represent a conjunction of properties: $f(s, c_1, c_2, \ldots) = \wedge f_i(s, c_{i1}, c_{i2}, \ldots)$. For instance, a property of the event might be takes_place($s$, Spain). The unexpectedness of $s$ is:

$$U(s) = C_w(f(s, c_1, c_2, \ldots)) - C(f(s, c_1, c_2, \ldots)). \quad (2)$$

It is easy to define context based on (2):

*Context =*
*properties and constants involved in complexity drop.*

Using complexity chain rule, we can write:

$$C(f(s, c_1, c_2, \ldots)) \leq C(f) + C(c_1|f) + \ldots + C(s|f, c_1, \ldots). \quad (3)$$

Conditional complexity $C(x|y)$ means the minimal description length of $x$ when the description of $y$ is available. (3) generalizes easily to conjunctions $\wedge f_i$.

We see from (2) and (3) that when telling a story or pointing to a problematic situation, the mention of contextual elements such as $f$ or $c_i$ encroaches on unexpectedness, as it diminishes the gap between causal complexity and description complexity.

## Topic connectedness explained

Topic connectedness offers an opportunity for conversational narrators to save on the description side under the following hypothesis:

Hypothesis: *Elements of the previous context are available for free for further descriptions.*

For instance, if $T_{-1}$ represents the preceding context and if $f$ and $c_1$ are part of it, then $C(f|T_{-1}) = 0$ and $C(c_1|f, T_{-1}) = 0$. They disappear from (3). Since $T_{-1}$ has no reason to have a causal effect on $s$, $C_w(s|T_{-1}) = C_w(s)$, and (2) becomes:

$$U(s \mid T_{-1}) = C_w(s) - C(s \mid f, c_1, T_{-1}). \quad (4)$$

We can see that if $f$ and $c_1$ are part of the current context (*i.e.* contribute to the complexity drop in (1) and are thus relevant):

$$U(s \mid T_{-1}) > U(s). \quad (5)$$

We can conclude that the situation is more unexpected after $T_{-1}$ than in the absence of any context, and that the presence of $f$ in $T_{-1}$ makes it (more) relevant. As a consequence, an event that would be impossible to introduce out of the blue may get enough unexpectedness to be worth telling.

For instance, in the 'burro' story, elements like 'trip', 'foreign country' or 'communication failure' are available for free from the previous story about attempts to ask for milk at breakfast in Italy (see Table 1). Moreover, 'butter' appears simple as 'milk' was previously mentioned, and 'Spain' would appear simpler than most other countries (seen from France) as 'Italy' was mentioned. The second story would have been less unexpectedness without these elements already available. Similarly, in the argumentation round of Table 2, the close analogy between the TV and the radio getting possibly damaged in standby mode makes the second discussion much easier to introduce. The analogy

[4] Note that the 'resource-bounded' restriction makes the notions of complexity and of unexpectedness computable (Saillenfest & Dessalles, 2015).

spares the complexity of describing some elements of the second discussion (consumer electronics, standby mode, getting damaged), making the problem worth discussing about. In the excerpt, note that despite the close analogy, the speaker still feels the additional precaution 'A totally unrelated issue' (original: "*une question tout à fait à côté*") to be necessary when introducing her topic.

## Discussion

Hobbs (1990) wonders "to what extent topic drift [is] a matter of cognition and to what extent a matter of convention". The above development suggests that social conventions play hardly any role, beyond the mere control of the unexpectedness threshold (as a result, switching topic might be easier in relaxed or intimate situations).

Could it be that the reuse of contextual elements from one context to the next would just be due to some sort of cognitive laziness or inertia on the speaker's side? We can exclude this possibility: as we saw, topic connectedness is not only a fact, but also a requirement. A same topic that would be interesting during a story round or an argumentation round may appear inappropriate or even pathological when introduced out of the blue (Sacks, 1992). The present paper suggests that a cognitive determinism is involved.

When introducing a topic abruptly, bringing concepts and names into the new context adds to descriptive complexity and, as a result, diminishes unexpectedness, up to a point that the new topic is at risk of loosing all relevance. Already mentioned concepts or names are, by contrast, descriptively costless. The very existence of 'story rounds' or 'argumentation rounds' seems to be entirely due to the temptation of using elements of the previous context to enhance the unexpectedness of the next one. The demand for unexpectedness appears to be a universal property of human spontaneous conversation. Topic coherence through conversation seems to be a side-effect of this requirement.

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