

Working out the plot: the role of Stories in Social Machines

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ABSTRACT

Although Social Machines do not have yet a formalized definition, some efforts have been made to characterize them from a “machinery” point of view. In this paper, we present a methodology by which we attempt to reveal the sociality of Social Machines; to do so, we adopt the analogy of stories. By assimilating a Social Machine to a story, we can identify the stories *within* and *about* that machine and how this storytelling perspective might reveal the sociality of Social Machines. After illustrating this storytelling approach with a few examples, we then propose three axes of inquiry to evaluate the health of a social machine: (1) assessment of the sociality of a Social Machine through evaluation of its storytelling potential and realization; (2) assessment of the sustainability of a Social Machine through evaluation of its reactivity and interactivity; and (3) assessment of emergence through evaluation of the collaboration between authors and of the distributed/mixed nature of authority.

Categories and Subject Descriptors

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General Terms

Theory, Human Factors, Design

1. INTRODUCTION

Social Machines, as conceived by Berners-Lee [3], follow a model of computation where, rather than separating humans from machines, new modes of collaborations and contributions of humans and machines (human-human; human-machine; machine-machine) are instigated. As a result, it is the whole – humans, machines, and their interactions – that constitutes a Social Machine. A more concrete, clear-cut

definition of Social Machines has yet to be formulated; however a number of characteristics of Social Machines, if not a characterization, has been identified in previous work: Social Machines have at least one explicit purpose (and often more than one), they tend to have emergent properties, they go through lifecycles, and they can combine (e.g. linearly, compositionally) to form evolving ecosystems [7]; they can be classified according to the types of constructs that they implement around the following themes: tasks, purpose and context of participation; participants and roles; motivation and incentives for participation [20].

As a complement to these approaches to understanding and analyzing Social Machines, in this paper we propose a radically different strategy to engage with them as entities and as a concept. We believe that the main reason why Social Machines seem to resist definition is their multifarious complexity: they usually combine widely disparate ranges of scales at which they operate, from the human cognitive system to the simplest sorting algorithm, from the constituent unit level to the crowd (humans and machines); they are perpetually in motion, particularly when they thrive; and they are imbued with sociality, mutability, and emergence. What we propose here is to examine Social Machines from a storytelling perspective, both in analytical and design terms. We argue that drawing an analogy between Social Machines and narratives will allow us not only to analyze existing Social Machines transversally (rather than level by level or layer by layer), but also to identify criteria by which the health of a Social Machine can be evaluated. And, crucially, this storytelling prism will allow us to shine a light on the social aspects of Social Machines.

In a first instance, we present what we mean by stories and storytelling and, using the characteristics of narratives, proceed to uncover why Social Machines can be viewed as stories. Then, we will consider the examples of three types of Social Machines that each present interesting behaviours in terms of where they are in their lifecycles and how social they are. Finally, we will argue that the health of a Social Machine can be evaluated through the observation of the stories *within* and *about* it.

2. SOCIAL MACHINES AS STORIES

Why adopt a storytelling perspective to study Social Machines? This idea is rooted in the observation that much

attention has been given to the internal functioning of a Social Machine, thereby tipping the balance towards the “machinery” side of Social Machines; the question that remains wide open and relatively unexplored is the following: what is social about a Social Machine? By adopting a storytelling view on Social Machines, we facilitate the exposition and expression of their sociality.

There is a wide consensus in the cognitive sciences, in anthropology, in the humanities, in philosophy that stories play a major role in human behaviour and in sociality. The psychologist and philosopher Jerome Bruner holds that “just as our experience of the natural world tends to imitate the categories of familiar science, so our experience of human affairs comes to take the form of the narratives we use in telling about them” [5]. In other words, stories are pervasive: they are sense-making devices; they are characteristic of human thought; they are omnipresent in social interactions and communication [18, 4]. By weaving stories between and around facts and events, humans make sense of their experiences, of their memories, of other humans’ actions. Stories are hence one way in which sociality, interactions, circulation of ideas, knowledge, and thought occur. In this particular context, it is therefore in a wide sense that we use the terms: “story”, “storytelling”, “narrative”; we do not restrict ourselves to fiction: autobiographical accounts (written and spoken) are stories, so are news reports, legal records, medical histories, etc...

2.1 Thriving Social Machines, stories worth telling

Stories contextualize actions and interactions, they allow for dynamics, for transitions, for linking between scales (e.g. individual to group), and for the circulation and evolution of ideas. So, carrying forward the notion that storytelling is intrinsic to sociality, it is worth identifying what elements make a story worth telling and what ingredients facilitate social enactment. Aggregating from various sources, ranging from creative writing, narratology, psychology, and literary criticism [13, 11, 1], we can put forward the following as keys to “good stories”: (i) characters; (ii) settings – material, temporal, spacial; (iii) degrees of familiarity, of unexpectedness, of novelty; (iv) problems, conflicts, mysteries; (v) sharpness of situations, contrasts, ambiguity; (vi) actions and interactions; (vii) liminality, change, evolution, transformation; (viii) resolution, discovery. This list is of course not exhaustive, and stories worth telling don’t need to combine all of these ingredients; furthermore, the notion of “good story” is also intrinsically cultural [5]. But by incorporating these key elements, stories worth telling result in engagement, a rational engagement, an emotional engagement of the receiver of the story, whether a reader or a listener. By this response to the story, the receiver becomes more than a passive recipient, s/he turns into a participant, an actant (to adopt a sociological term from Actor Network Theory [14]) not only in the storytelling but actually in the story itself [2]. Notice also how this list of elements doesn’t constrain the structure of the stories in any way. This is where assimilating Social Machines to stories is interesting. As for sociality to be enacted in a Social Machine there needs to be communication, circulation of ideas, knowledge and thought, the sociality of a Social Machine is related to whether its story is worth telling. It follows that for a Social Machine to thrive, for it

to be a good story, it needs the right ingredients, the ingredients that will fuel the story, and allow any actant or external observer to weave these elements into their own storylines by adopting their own preferred story structure.

These key elements then become *plotpoints* through which *storylines* (or curves, or loops) can be drawn. Rather than looking at a Social Machine as an entity where the “machinery” is a *set structure* of hardware, software, and assigned roles that somehow allows for sociality (how?), we propose to consider the “machinery” (e.g. infrastructure), as *plotpoints* through which stories can pass, allowing for non-deterministic communication, for non-combinatorial circulation of ideas, for non-preset cooperation, for innovation, for invention, and thereby for sociality. These plotpoints might be, for example, elements of set narratives, be they defined by hardware, software, or assigned roles, either from inception or as emerging during the lifecycle of the Social Machine. Thriving Social Machines, like stories and thought, are not tree-like. Their structure isn’t tree-like as decision trees are, in fact they are not only non-combinatorial, and also non-deterministic because they have elements of fluidity and non-predetermination due to their social component. Thriving Social Machines, like stories being told, are more rhizome-like [8]; storylines can emerge from anywhere, rather than from specific node points, they can develop non-linearly, they can merge, as rhizomes do. A thriving Social Machine can thus be seen as a “matrix narrative” [13], where the term matrix is used with its etymological reference to a womb, to a place of origination and development, rather than to the table structure used in computation. As such, a thriving Social Machine is a story that contains interwoven threads of various storylines, or potential storylines, within itself.

2.2 Stories within Social Machines

In both the cases of a good story and of a thriving Social Machine, the whole is more than the sum of its constituent parts. It is striking, that in Social Machines, a number of storylines can always be derived from the actions, interactions, and behaviours within it; they are implicitly there. But who might make them explicit, who tells these stories, and who is listening? In narratological terms, narrative communication normally occurs at three levels: the author/reader level (level of non-fictional communication); the narrator/addressee level (level of fictional mediation); and the characters’ level (level of action) [13]. In Social Machines, the boundaries between those levels become blurred. The told storylines *within* Social Machines usually emanate from an insider, an actant in the Social Machine, one of its constituent parts, whether animate or inanimate. So that the story can be either a first person narrative, where the narrator is a character in the story, or a figural narrative, where the narrator is a passive observer on the inside (animate or inanimate) adopting the point of view of a character. Each implicit storyline *within* a Social Machine can be told by a narrator, who also becomes an author and a storyteller (in a performative sense), for the benefit of other actants in the Social Machine (e.g. a help/support thread in a forum within a Social Machine can be seen as a storyline), in which case these other actants can contribute to the storyline, weave in their own storylines, influence the course of the storyline. The told internal storylines also give a reader,

whether internal or external to the Social Machine, a sense of how the constituent elements of the Social Machine fit together, how interactions occur, from an insider's perspective. These storylines facilitate sociality; sociality is intrinsic to them. Each character in the story-Social Machine is potentially an author-and-narrator, and a reader-and-addressee. In section 3, we will illustrate this point by showing that thriving Social Machines not only implicitly tell stories internally, but also tell stories that are worth telling (and are told) *within* and *about* the Social Machine.

2.3 Stories about Social Machines

When internal storylines are told for the benefit of an indiscriminate audience, they are usually woven into a story *about* the Social Machine, a story which is primarily geared towards an audience external to the Social Machine. This outwards facing storytelling generally adopts an authorial narrative style, where the narrator is an omniscient observer of the story-Social Machine, but not a character. One of the effects of this outwards storytelling is that audiences can become participative; upon hearing or reading a story about a Social Machine, they might decide to become a character in the Social Machine, to participate in it. These stories *about* the Social Machines are usually explicit, they can have sense-making motivations, like academic communications and papers, or marketing drives aiming to recruit more participants, but they are also intrinsically social. Regardless of their motivation, stories *about* a Social Machine can help establish and maintain dynamic feedback loops of sociality in and around the Social Machine. In fact, the stories *about* a Social Machine situate themselves at the blurred frontiers of the Social Machine, yet fully participate in its lifecycle.

3. EXAMPLES

The examples in this section illustrate the concept of story-Social Machine. Each one involves people and technologies playing out roles (actants) within an evolving Social Machine that has its own overt purpose. In Wikipedia and in the Social Edition, we see a similar goal in the construction of a well-defined artefact. In Zooniverse the pursuit of scientific advances and of discovery motivates citizens and scientists—a story of excitement and adventure. Facebook is very much a story about the stories of people's lives and it is significant that they purport to be autobiographical, in contrast to the strictly biographical life writing and open content of Wikipedia. Each story-Social Machine evoked here features an online discussion space in some form, but the characters and roles are different, whether they be readers, writers, experts, or 'answer people' [26, 25]. Each one of these Social Machines is also in a different phase of its own lifecycle and, for different reasons, they are interesting stories in their own right: the decline of Wikipedia through 'editor erosion' [12], for example, has recently attracted attention.

3.1 Zooniverse

The Zooniverse is a thriving Social Machine that began with a single project, the Galaxy Zoo citizen science project, which was launched in July 2007, and attracted an overwhelming response from the public, engaging 165,000 volunteers in the morphological classification of images of more than 900,000 galaxies. It proved its purpose in the delivery

of new scientific results—both through analysis of the classifications but also through serendipitous discoveries. The scientific outcomes are understood to be one of the incentives that has maintained the participation; i.e. this is explicitly a citizen science project, not just crowdsourcing [19]. The Galaxy Zoo Social Machine (the software and its community) led to the creation of Zooniverse¹, a platform for continual delivery of new citizen science projects each of which invites public participation in data analysis that researchers cannot accomplish by other methods [23]. The 20 Zooniverse projects running at the outset of 2014 range across space, nature, biology, medicine, climate science, and the humanities, and the website currently counts around 1 million registered participants. Zooniverse can be seen as a thriving Social Machine and as a Social Machine factory, with 7 projects launched in 2013 and several new projects already in production for 2014. In terms of output, 250 scholarly articles present results from Zooniverse projects, with 59 dedicated to Zooniverse findings, and 39 publications have resulted from Galaxy Zoo alone. This is, in a brief, a story *about* the Zooniverse Social Machine.

Zooniverse projects are themselves highly storified, as can be seen by visiting the website. For example, the Planet Hunters project is presented with the text "Find planets around stars...The Kepler spacecraft stares at a field of stars in the Cygnus constellation and records the brightness of those stars every thirty minutes to search for transiting planets", and for the Serengeti project "Go wild in the Serengeti! We need your help to classify all the different animals caught in millions of camera trap images". The discoveries are storified too, for example Hanny's Voorwerp, which started as a story *within* with a collection of specific images as plot-points, now has its own dedicated website, and the story has even been presented in comic format². As well as classifying images, Zooniverse volunteers interact by participating in discussion fora and we see the online community roles play out around the scientific process [10, 15].

3.2 Wikipedia and the Social Edition

Wikipedia is a favourite example of a Social Machine, due to its familiarity (very wide engagement as readers, and many have also experienced editing) and the wide understanding that the protocols and etiquette of editing have co-evolved through usage; i.e. the behaviour of the machine is clearly socially constituted. As a story the setting is modelled on the 2000-year-old notion of the encyclopedia (e.g. Pliny the Elder's *Naturalis Historia* –1st cent. AD), created by experts to capture and transmit human knowledge, but enacted with the affordances of the digital world which provides distribution with no copying costs, mass write access for editing contributions, access to detailed version and provenance information, and machine processable content. In Wikipedia every article comes with an implicit storyline made of the story/ies of its contributions, edits and associated discussion; every editor has a story of articles and edits, of expertise and arguments. Remarkable features of the Wikipedia story include the democratization of content creation, and the number of contributors who engage anonymously against the common expectation that contributors are motivated by reward or reputation. It is also notable for its expansion

¹See: zooniverse.org

²See: <http://www.hannysvoorwerp.com/>

in other countries and cultures, where the behaviour of the Social Machine has become reconstituted in other contexts (for example, in China there are different rules around “reverting” edits and around page deletion). That the content is open is significant and there is a degree of automation in how the content is reused by other Social Machines.

All these features constituted stories *about* Wikipedia that were worth telling, and were told. Today however, the characters in the story-Social Machine are codified in that the social roles are mechanically well-described, with ‘Wikipedians’ placed in user categories. The evolution of the site is the subject of study and commentary [25, 22], with an MIT review article telling the story of decline: “the loose collective running the site today, estimated to be 90 percent male, operates a crushing bureaucracy with an often abrasive atmosphere that deters newcomers who might increase participation in Wikipedia and broaden its coverage”. The decline of Wikipedia can be quantified: as well as editors of individual contributions there are administrators who edit the encyclopedia itself (they are granted the ability to block and unblock user accounts and to delete, protect and rename pages) and to achieve “admin” status is sufficiently hard that, for example, in March 2010 only two people achieved it; the number of active administrators was around 1000 in 2007 and is 600 today. The assigned roles of editors have become frozen into (mandatory) plotpoints that over-constrain the stories *within* by imposing authority.

Though Wikipedia has become an exemplary Social Machine in spite of its current decline, it is by no means the only model for ongoing content creation and curation. Indeed encyclopedias have been produced with mass contribution before: over two thousand scholars worked on the Yongle Encyclopedia in China, incorporating 8,000 ancient texts (19 volumes are now available digitally³). Traditionally the critical editions of literary texts have been created by experts reconstructing texts by drawing on multiple versions and sources, but we now see the rise of the *social edition* which enables ongoing engagement with the material through collaborative annotation, user-derived content, folksonomy tagging, community bibliography, and shared text analysis [21]. Like Wikipedia the scholarly social edition benefits from the use of hypertext to link in all sources, the provision of tools to help work with the text, and by the publication being able to evolve continually. Unlike Wikipedia, social edition of historical texts not only allows for but encourages the multiplicity of versions the Social Machine affords.

3.3 Facebook

Facebook provides a contrast with the previous examples: it is not open, it is driven by a Fortune 500 corporate, and it is multi-purpose in that it builds targeted advertising into the machine. Whether Facebook is a Social Machine can be debated, and its equivocal status makes it a useful test of our methodology. In Facebook people link up and share ongoing lifestories, photos, and links to external content, and discourse occurs asynchronously around these; it is also a messaging platform, and an application platform whereby third party apps (e.g., adventure games, Farmville), are plugged in for the benefit of its users. A story *about* Facebook, on its external boundary, would be that it collects and shares ‘extraordinary stories of people using Facebook’ and this carries

³See: <http://yongledadian.bodleian.ox.ac.uk/>

the stories that can be gleaned through mass use, like the review of the year showing ‘top life events’ and most talked about topics⁴. Also on this boundary, a service⁵ collates and delivers a physical book derived from Facebook content, a ‘Social Book’ with statuses, comments and photos of oneself or a friend. One of the striking facts about Facebook, is that it is difficult to find storylines *within* it that are not “just another user’s journey” (in the large sense of personal journeys or ‘group’ journeys, to use Facebook’s own terminology). A second fact, revealed by those examples, is that these storylines *within* are all projections outwards, with little sense of the nature of “the outwards”. As a result, most of these potential storylines run in parallel, with very little chance to interweave; they might intersect, but they usually stay on their own course, save for the occasional detour. Facebook is in decline as it is failing to keep its participants engaged; indeed, many have started to migrate towards different Social Machines, such as Twitter [16], particularly teenagers⁶.

4. STORYTELLING AS A STETHOSCOPE FOR SOCIAL MACHINES

As we have seen in the examples above, storytelling offers a unique way of probing the health of a Social Machine. And because we think of Social Machines as having lifecycles [7], we contend that rather than thinking of a Social Machine in terms of success or failure, it is more useful to assess where in its lifecycle a Social Machine might be. Note however that this view does not preclude a Social Machine from stagnating in its rising stage and then declining without having ever thrived. In this section, we propose to revisit some of the concepts we presented in section 2 and, in the light of the examples in section 3, we suggest an examination of specific aspects of the storytelling *within* and *about* a Social Machine in order to diagnose it. To keep the diagnostics simple, we adopt the terms: “rising”, “thriving”, and “in decline” to express our general diagnostic on a Social Machine. Our chosen storytelling tools to establish this diagnostic will enable us to probe the states of sociality, of emergence, and of sustainability of a Social Machine. We do not claim that all a Social Machine needs to thrive is to score highly in each of those three domains, we do believe however that for a Social Machine to thrive these three aspects need to be vigorous, as exemplified by the Zooniverse example (section 3.1).

4.1 Sociality through storytelling potential and realization

We have argued in section 2, that sociality is engendered by sense-making and interactivity, and that storytelling, which facilitates the circulation of ideas, knowledge, and thought, is inherent to sociality. So our first probing point in a Social Machine is its storytelling potential. Are the ingredients that make for a good story present? Beyond implicit storylines, are there enough plotpoints to make a storyline explicit, for that story to be worth telling, and eventually told? Are there enough of those stories *within* and *about* the Social Machine, that can be and are told? It is by telling

⁴See: <http://www.facebookstories.com/>

⁵See: mysocialbook.com

⁶See data on: <http://www.statista.com/topics/1164/social-networks/chart/1563/facebook-relevance-waning-among-american-teens/>

stories *within* and *about* Social Machines that a momentum can be created, that the circulation of ideas, knowledge and thought can occur and by which the sociality of a Social Machine is enacted. This approach to probing a Social Machine through its storytelling potential and realization has already been hinted at elsewhere [17], albeit in terms of trajectories through Social Machines and of purpose. The proposal we put forth here is an expansion on what Page & De Roure propose as we do not restrict ourselves to the viewpoint of an outside omniscient observer assigning a purpose to each trajectory, but also factor in the internal stories told by actants (authors-narrators-characters) in the Social Machine and hence with their own motivations, pursuing their own sense-making endeavour [5, 6]. The example of Zooniverse (section 3.1) shows that a highly storified Social Machine is easier to communicate about and within; not only is its storytelling potential high, not only are many of its implicit stories worth telling, they are also told. In such a configuration, the momentum gained by the number of stories being told and interwoven *within* and *about* the Social Machine empowers its actants as narrators, as authors, as well as characters. It is this perpetual motion and mutability of the stories engendered by the storytelling that maintains the sociality of a Social Machine, and that feeds it. Its storytelling potential is continuously renewed and (re-)realized.

4.2 Sustainability through reactivity and interactivity

The second probing point in the health assessment of a Social Machine auscultates the reactivity of the Social Machine to storytelling and the interactivity of the storytelling. This assumes that at least some degree of storytelling potential and realization has already been detected in the Social Machine, that some degree of sociality has hence already been identified. One of the challenges for a Social Machine to keep thriving is to keep its storytelling potential and realization high. Its sustainability is thus tightly connected with its capacity for renewal. If plotpoints, as defined in section 2.1, deprecate over time (e.g. they might have been overused, thereby losing their novelty, or have become mandatory), then it is essential that the Social Machine has the capacity to renew its stock of plotpoints; if the characters-narrators-authors rarefy, it is essential to be able to recruit new characters-narrators-authors. The ability of the Social Machine itself to react to change, as well as the possibility for actants to interact, is therefore crucial to its sustainability. Interactivity can be evaluated by inspecting the complexity of the stories in terms of their number of constituent storylines. How easy is it for an actant to draw their own storyline and to steer it towards the storyline of another actant? How much effort of adaptation is needed to weave a storyline within another composite story? How rhizome-like or tree-like are the story structures? How constrained are the ways in which storylines can merge, diverge, separate, amalgamate? Reactivity is another way, in this context, to test how flexible and open the interactivity is, how much the Social Machine allows for improvisation. Given that we have observed how in a (thriving) Social Machine, all actants are potentially narrator-authors as much as addressee-readers, how wide and easy is the audience's participation in the storytelling of the Social Machine? Does this audience have the capacity to renew itself, by which we mean, how often do external readers of a story *about* a Social Machine become

a character *within* it (and thus a potential internal author-narrator)? In a way, a lack of reactivity and interactivity is just one of the ways in which a Social Machine might quite literally “lose the plot”. The example of Facebook (section 3.3), shows how even with a storytelling potential, a lack of reactivity can be seen as one of the reasons for its decline; the storylines are there, some are told, but their interweaving is very loose. The Social Machine has lost its reactivity and some of its interactivity.

4.3 Emergence through collaborative authorship and mixed authority

The third probing point in the health assessment of a Social Machine evaluates the degree to which authorship of the storylines *within* the Social Machine is collaborative, and to what extent authority is distributed, or mixed. Again, this assumes that at least some degree of sociality has already been detected in the Social Machine, but it also relies upon a degree of sustainability being present. Through storytelling, the ways in which individuals interact with the wider group within the Social Machine, and *vice versa*, are made more tractable; emergent properties such as self-organization of the actants, or of subsets of actants within the Social Machine become more visible. Provided that storytelling potential and realization, as well as reactivity and interactivity are present, the ways in which emergence will express itself are: through the degree of co-operation between actants that are drawing a common storyline, and through the ways in which authority might or not be conferred on the collaborative storylines. The reason why these two issues of authorship and authority are so closely connected in the case of Social Machines can be traced to the blurring between author, narrator, reader and addressee as well as character. It is precisely in the space created by this blur that emergence occurs by means of unremitting co-construction, cooperation, self-organization, and collaborative (re-)definition of self-assigned roles [24, 9]. As a result, by assessing how frequently storylines merge and diverge, thereby doing and undoing collective storylines in a Social Machine, one gets a sense of the degree of collaboration that can be reached within the Social Machine; and by assessing the kind of authority that is exercised over the collective storylines, one can appreciate whether emergence might be facilitated. In the example of Wikipedia (section 3.2), a highly formal bureaucracy assigns authority rigidly, thereby minimizing the blurred space where emergence can occur.

5. CONCLUSION

In this short position paper we have examined Social Machines from a storytelling perspective. We have drawn an analogy between Social Machines and narratives in order to analyze existing Social Machines and to suggest criteria to evaluate the health of a Social Machine. This approach was motivated by a desire to foreground sociality in the design and analysis of Social Machines; it explores the conjecture that stories are a means of achieving this. Our examples—Zooniverse, Wikipedia, Social Editions, and Facebook—are at different stages in their lifecycles and exhibit different degrees of sociality.

Following through with this storytelling perspective, we propose three axes of inquiry to evaluate the health of a social machine: (1) assessment of the sociality of a Social Machine

through evaluation of its storytelling potential and realization; (2) assessment of the sustainability of a Social Machine through evaluation of its reactivity and interactivity; and (3) assessment of emergence through evaluation of the collaboration between authors and of the distributed/mixed nature of authority.

This initial exploration shows great promises for the use of the narrative metaphor as well as thrown up several avenues of further exploration. As Social Machines that are working out their plots, we too will pursue this line of enquiry in order to refine this methodological framework. For the sake of clarity and brevity we have not addressed here the many Social Machines which are explicitly *for* stories, ranging from adventure games (e.g. Massively Multiplayer Online games) to collaborative editing of drama scripts, nor the many Social Machines which constitute the evolving scholarly communications ecosystem and deal with papers, articles, blog-posts or records of experiments (i.e. the stories of science and research).

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