

Rhetorical temporality in online scientific communication: An analysis of the US and Swedish Academies of Sciences websites

Olga Menagarishvili & Bret Zawilski

Metropolitan State University (USA) & Maynooth University (Ireland)

olga.menagarishvili@metrostate.edu, bret.zawilski@gmail.com

Abstract

Professional organizations use websites as spaces for the creation of communities. Academies of Sciences are examples of professional organizations, and their websites represent scientific discourse used in these scientific communities. However, little to no attention has been paid to the ways in which websites of Academies of Sciences present these scientific organizations in general and use rhetorical temporality for that purpose in particular. In this article, we attempt to explore how rhetorical temporality functions across two Academies of Sciences' websites associated with different nations: the US National Academy of Sciences and the Royal Swedish Academy of Sciences. We situated our research within the frames of epideictic rhetoric, the role of consensus in the rhetoric of science, and rhetorical temporality. We developed a coding scheme that we applied to our data to categorize the individual pages on each site according to how they were temporally situated. Our analysis revealed several differences in the ways that the temporal categories we developed were used within each site. The coding scheme we created shows potential for future application to websites belonging to other professional organizations.

Keywords: scientific communication, digital communication, rhetoric of science, Academies of Sciences, rhetorical temporality.

Resumen

Temporalidad retórica en la comunicación científica en línea: un análisis de los sitios web de las Academias de Ciencias de EE.UU. y Suecia

Las organizaciones profesionales se sirven de los sitios web como espacios para la creación de comunidades. Las Academias de Ciencias son ejemplos de

organizaciones profesionales y sus sitios web son una muestra del discurso científico utilizado en estas comunidades científicas. Sin embargo, apenas se ha prestado atención al modo en que las sitios web de las Academias de Ciencias presentan a estas organizaciones científicas y a cómo explotan la temporalidad retórica para ese propósito en particular. En este artículo exploramos cómo funciona la temporalidad retórica en dos sitios web de dos Academias de Ciencias: la Academia Nacional de Ciencias de EE. UU. y la Real Academia de las Ciencias de Suecia. Nuestra investigación se sitúa en el marco de la retórica epidíctica, el papel del consenso en la retórica de la ciencia y la temporalidad retórica. Hemos desarrollado un esquema de codificación que aplicamos a nuestros datos para clasificar las páginas individuales de cada sitio de acuerdo con su ubicación temporal. Nuestro análisis ha evidenciado varias diferencias en el modo en que se utilizan en cada sitio las categorías temporales desarrolladas. El esquema de codificación que hemos desarrollado presenta un importante potencial para aplicaciones futuras en sitios web pertenecientes a otras organizaciones profesionales.

Palabras clave: comunicación científica, comunicación digital, retórica de ciencias, Academias de Ciencias, temporalidad retórica.

1. Introduction

The websites of professional organizations not only represent spaces for the creation of communities, but also serve as a space for the invention of a temporal identity as they present a history, reiterate the current position, and signal future directions for an organization. At the same time, the websites of Academies of Sciences are examples of scientific discourse, and their temporal nature becomes even more important when considering the ways in which science as an enterprise has always been rhetorically situated. Ways of communicating about science online have been explored (for example, Trench, 2008). Other sources have also discussed more specific genres of online science and scientific communication, such as blogs (Colson, 2011), online journalistic sites (Bubela et al., 2009), and grant-funding organizations (Palmer & Schibeci, 2014). However, no attention has been given to the way that scientific Academies have presented themselves through their websites in general and through their use of rhetorical temporality on those websites in particular.

As Palmer and Schibeci (2014, p. 513) noted, “little or no attention” has been granted to sites of peer communication within the sciences. While the websites of the Academies address a variety of audiences, they are also examples of peer communication among professionals within the field.

Additionally, these organizations serve as science research funding bodies, and so the rhetorical strategies being employed by the websites of these Academies play a significant role in the function of scientific communication.

We selected the US National Academy of Sciences and the Royal Swedish Academy of Sciences due to the similarity of their stated mission and goals. The US National Academy of Sciences describes itself as an organization that aims:

“to provide independent, objective analysis and advice to the nation and conduct other activities to solve complex problems. [...] [They] also encourage education and research, recognize outstanding contributions to knowledge and increase public understanding in matters of science, engineering, and medicine”.

Similarly, The Royal Swedish Academy of Sciences positions itself as:

“an independent organisation, whose overall objective is to promote the sciences and strengthen their influence in society. [...] [Its activities] primarily focus on: being a voice of science in society [...], providing a scientific basis for public debate [...], recognising outstanding contributions to research [...], disseminating knowledge to the public [...], [and] mediating international scientific contacts”.

According to each of these statements on their respective websites, these Academies are both devoted to preserving the independence of scientific endeavors while seeking to recognize “outstanding contributions” as well as aligning in other goals.

In this study, we attempt to explore how rhetorical temporality functions across two scientific Academy websites associated with different nations: the USA and Sweden. By examining the websites from two countries, we look to trace the multiple ways in which similar organizations can be temporally constructed in different cultural contexts.

2. Theoretical background

For this project, we situated our research within three frames: epideictic rhetoric, the role of consensus in the rhetoric of science, and rhetorical temporality.

We recognize that organizational websites serve as examples of epideictic rhetoric as they reflect, in the present moment, the values of the organizations they represent. Organizational websites have been studied from this perspective. For example, Farcaş (2016) looked at the ways in which the websites of the ministries of the Romanian Government present, communicate, and define institutional identity. A study conducted by Sillince and Brown (2009) focused on police websites and explored how multiple organizational identities are constructed through rhetoric to maintain and enhance the legitimacy claims made by the organizations. We chose to use this framework because the epideictic nature of these sites also calls attention to the way in which the temporality of the present is used to establish the values and prerogatives of these organizations.

Our second frame is the role of consensus in the rhetoric of science. Many scholars have previously argued that science is a rhetorically constructed discourse (Simons, 1980; Miller & Selzer, 1985; Fahnestock, 1986; Prelli, 1989; Gross, 1990; Ceccarelli, 2001; Walsch, 2010; Reid, 2019). More specifically, drawing on the work of Alan Gross (2006), we recognize that scientific bodies often use a rhetorical appeal to objectivity as a persuasive strategy that lends credibility to scientific endeavors. Yet Gross (2006, p. 22) also emphasizes the role that consensus plays in these communities, noting that “at any time, in any science, scientists must make up their minds about what needs to be explained, what constitutes an explanation, and how such an explanation constrains what counts as evidence”, and these decisions, situated within a community, must be made in connection with other scientists. We selected this frame because each of the Academies we study represents one of the authorizing bodies that often grapple with presenting science to various audiences as well as signaling the collective agreement surrounding the ongoing goals of scientific research. In other words, these communities are places where consensus is created as members of the Academies work toward deciding what needs to be explained.

Our third frame is rhetorical temporality in websites. Most research that has been done in this area focused on news websites. For example, Ybema (2010, p. 481) discussed “how the editors of a Dutch national newspaper constructed their newspaper’s identity in temporal discontinuity talk, discursively constructing a contrast between the ‘old’ and the ‘new,’ between legacies from a common past and plans for the future”. A study conducted by Bødker and Brügger (2018, p. 56) explores “how the temporalities of online news have developed since the first news sites in the mid-1990s” and focuses on the

analysis on morphological and syntactical levels while Extröm (2016) examines the interaction of past, present, and future in online news of disasters. We selected this frame because theories of the rhetoric of science suggest that the temporal lenses used by communicators within the field carry meaning and are not an arbitrary construction.

Other studies discuss temporality in online consumer reviews and online corporate pictorials. For example, Vásquez (2015, p. 5) explores “how both the remote past and the present are variably deployed as discursive resources” by the authors of user-generated online consumer reviews and provides references to the past realized with such linguistic features as past temporal adverbs, grammatical aspect, and prepositional phrases. Rämö’s (2017) study discusses examples of time and temporality in online corporate pictorials, including the captured moments motif, decisive moments motif, and allegory of time motif.

We agree with Ybema (2010, p. 481), who points out that “temporality is generally acknowledged as a critical ingredient in processes of identity formation”. Bødker and Sonnevend (2018, p. 3) also consider journalism as “a series of interrelated practices for the social construction of time” and point out that it “arrests the ordinary and the usual in various forms of texts that create feelings of simultaneity, help define the contemporary, outline possible futures, and shape our understanding and memories of the past”. However, in another analysis of the temporal spectrum in news narratives, Neiger and Tenenboim-Weinblatt (2016, p. 139) emphasize the importance of going beyond the three conventional orientations that are usually defined as “past-present-future” and introduce five clusters of temporal layers and different journalistic roles: “updating (present and immediate past/future), reporting (recent past), contextualization and ritualistic functions (midrange to distant past), analysis (near future), and projection (far/conjectured future)”. Zelizer (2018, p. 114) further discusses the need to use more “differentiated, nuanced, and active” temporalities instead of simple and linear assumptions of time in digital news.

For the purposes of this study, we rely heavily on the use of our third frame, rhetorical temporality, in our analysis. However, the prior two frames functioned implicitly throughout our analysis. Considerations of our first frame, epideictic rhetoric, informed all of our temporal coding as we found through our initial research that organizational websites were frequently connected to considerations of present values held within the

organization—a fundamentally epideictic concern. Additionally, our investigation of the rhetorical temporality of these websites provided support for the argument that these spaces are active communities in which members strive for consensus—our second frame—through the construction of a temporal representation of the organization.

While research into each of these angles can be found separately for different kinds of websites (i.e., organizational websites (Sillince & Brown, 2009; Farcaş, 2016), news sites (Ybema, 2010; Extröm, 2016; Bødker & Brügger, 2018), and online consumer reviews (Vásquez, 2015), we found no studies that addressed websites of scientific Academies from the three angles discussed above (epideictic rhetoric, the role of consensus in the rhetoric of science, and rhetorical temporality). We feel that it is important to consider these frames in connection with the websites of these Academies because they provide valuable insight into the ways through which knowledge, consensus, and the construction of public awareness (similar to the purpose of the news sites previously studied) are deployed in a context that has not been previously explored. The purpose of this paper is to fill this gap by exploring how temporally situated content functions across two scientific Academy websites associated with different nations. Additionally, we will propose and use a coding scheme that will involve more nuanced temporalities.

3. Methodology

The two websites that we selected for this project were the website for the US National Academy of Sciences (<http://nasonline.org/>) and the website for the Royal Swedish Academy of Sciences (<https://kva.se/en/startside>). These websites were chosen because they represent similar organizations (Academies of Sciences) belonging to different nations, and they seemed well suited to a pilot research project using the framework of rhetorical temporality that we have developed as they involve peer communication as well as science communication targeted to a broader public, suggesting a diversity of content. Additionally, both websites contained content in English. More specifically, the entire US website was presented in English while the Swedish website had an English and a Swedish version. Because of the scope of this paper, we only analyzed the content published in English.

Even during our initial project development, changes to each of the websites were fairly regular, and we recognized that we would need to work with static

versions of the websites to ensure our dataset's consistency. In order to provide ourselves with a static text for analysis, we began our data collection by cataloguing both sites and creating archived offline versions of each site in May of 2017. The next step involved the creation of a visual sitemap of each website's pages going down to the third level of site organization (see Figures 1 and 2). We chose to limit our analysis to the first three levels because on both sites, content that we found below the third level was usually automatically generated from a database.

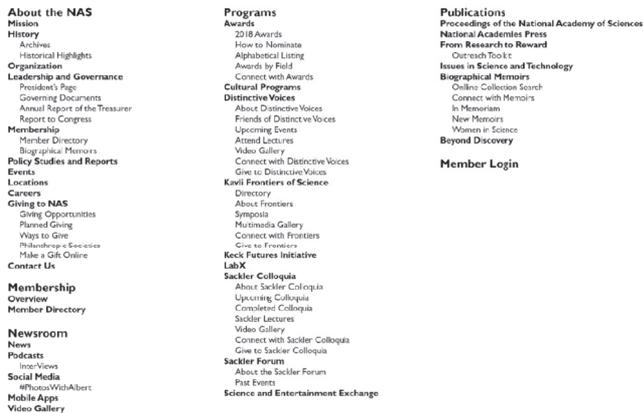


Figure 1. Sitemap for the US National Academy of Sciences.



Figure 2. Sitemap for the Royal Swedish Academy of Sciences.

We developed a coding scheme to categorize the content on each page, and while we were coding, we used the sitemaps (see Figures 1 and 2) to keep track of those coding decisions. Our coding categories, which we also explain below, can be found in Figure 3.

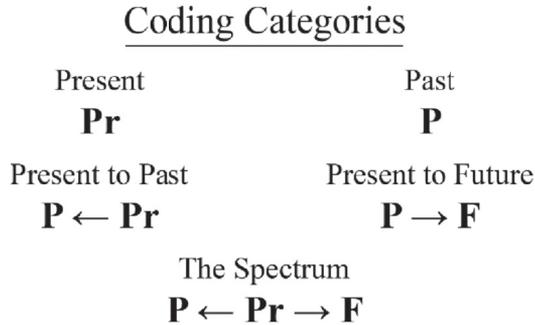


Figure 3. Temporal coding categories.

Pages coded as Present (Pr) were those that did not provide any forecasting or contextualization aimed at influencing future action or re-situating past activity in the organizations. An example of a page coded as Pr on the Swedish website would be the “Organization and Objectives”, which essentially provides an overview of the current structure of the Academy.

Pages coded as Past (P) were categorized as external documents that were merely attached to the sites. In this sense, pages coded as P were not created with the purpose of rearticulating the past, but rather as a space for the archival of prior texts or documentation. On the US site, we identified the organization’s *Annual Report to Congress* as an example of a document that was attached to the site with no explicit contextualization.

The most interesting of the categories we identified involved the development of vectors, represented by arrows, to signal that the choices regarding the past and the future events were made in the present. In other words, our perception of these texts highlighted the epideictic nature of these sites, which automatically situated past and future elements through the present.

Pages coded as Present shaping the Future (Pr → F) served as a space for each organization to project its goals or call for future action. These were often signaled by imperative statements designed to lead the audience to

some action or belief. Examples of pages coded as $Pr \rightarrow F$ on both the Royal Swedish Academy of Sciences and the US National Academy of Sciences websites were the “Events” pages, which often focused on promoting future events sponsored or hosted by the organizations.

Pages coded as Present shaping the Past ($P \leftarrow Pr$) often focused on contextualizing current activities by presenting a historical narrative. This historical contextualization presented the information in a way different from the temporality of a purely Past (P) temporal category. Examples of this category were frequent and could be found in the Royal Swedish Academy’s description of its major prizes and the historical legacies of these prizes.

Also, in some instances we made use of compound codes when multiple temporalities were signaled in a single page. For example, certain pages included both a contextualization of past events and projections of future activity, which we would code as $P \leftarrow Pr \rightarrow F$ to represent the multiple vectors at work. We referred to this coding category as the spectrum.

After some initial calibration of the deductive coding scheme, our interrater reliability was 100% across each of the sites, including instances of double-coding particular pages.

4. Results

After applying our coding scheme to the pages from the US National Academy of Sciences and the Royal Swedish Academy of Sciences websites, we found a distribution of percentages across the various temporal categories that signified visible differences in the way temporality was used in the two sites (see Table 1). This spread allowed us to focus on particular instances of disparity. Some of these pages were double-coded, which explains the difference between the total number of pages analyzed and the sum of instances for individual temporal categories. We counted double-coded pages twice (once for each category).

Website	Total number of pages analyzed	Pr	P	Pr → F	P ← Pr	P ← Pr → F
The US National Academy of Sciences	81	14 (17.28%)	5 (6.17%)	26 (32.1%)	27 (33.33%)	14 (17.28%)
The Royal Swedish Academy of Sciences	112	41 (36.61%)	12 (10.71%)	17 (15.18%)	41 (36.61%)	6 (5.36%)

Table 1. Total distribution of temporal categories across all pages.

To summarize, we found that the most frequent temporal categories we identified for the US National Academy of Sciences were $P \leftarrow Pr$ and $Pr \rightarrow F$; for the Royal Swedish Academy of Sciences, the most popular categories were Pr and $P \leftarrow Pr$. Conversely, the least popular category for the US site was P , and the least popular category for the Swedish site was $P \leftarrow Pr \rightarrow F$.

5. Discussion

After looking at how each temporal category was used in smaller sections of each site, we found two sections where the differences we identified were meaningful. Those were (1) pages defining each organization and its goals and (2) pages describing awards and prizes offered by the two organizations. Finally, we looked at pages that made use of the $P \leftarrow Pr \rightarrow F$ category as there were notable differences in the way this category was used.

5.1. Pages Defining Each Organization and Its Goals

The US website had 13 pages focused on defining the organization and its goals. One of the first trends that we noted was that US National Academy of Sciences made use of the $P \leftarrow Pr$ category and tended toward historization to highlight the credibility and reputability of the organization as a whole in places like the mission statement and the “Organization” page. More specifically, we found instances of $P \leftarrow Pr$ in seven out of the 13 pages (53.85%), while we only identified instances of Pr in three out of the 13 pages (23.08 %).

For example, the “Mission” page on the US site states:

Established by an Act of Congress, signed by President Abraham Lincoln in 1863, the NAS is charged with providing independent, objective advice to the nation on matters related to science and technology. [...] Nearly 500 members of the NAS have won Nobel Prizes, and the Proceedings of the National Academy of Sciences, founded in 1914, is today one of the premier international journals publishing the results of original research.

In this passage, the US National Academy of Sciences attaches itself to notable historical figures, such as President Abraham Lincoln, when describing its overarching goal. The content of this page also explicitly highlights its historical situatedness by providing several notable dates, including its founding in 1863 and the founding of its primary research publication in 1914. Finally, the passage also references the numerous members who have previously been awarded Nobel Prizes for their research, establishing a tradition of noteworthy contributions to the sciences. In many ways, the mission statement's primary passage spends much more time emphasizing its historical basis than defining the ongoing work that the organization supports. In accordance with our vector category, $P \leftarrow Pr$, this is an example of a description of the present work of the organization being heavily situated and shaped by an invocation of the past. Aspects of the past have been selected that highlight the current mission, a trend that we will see in other sections dedicated to establishing the identity of the organization.

Similarly, we see another example of this on the "Organization" page, where the US National Academy of Sciences is described in the following way:

The National Academy of Sciences was established in 1863 by an Act of Congress, signed by President Lincoln, as a private, nongovernmental institution to advise the nation on issues related to science and technology. Members are elected by their peers for outstanding contributions to research. Dr. Marcia McNutt is president.

This passage shares several similarities with the mission statement of the organization, including a reference to the founding date of the US National Academy of Sciences and the invocation of President Abraham Lincoln. Even though it provides a broad overview of the structure of the organization including its goals and the procedural consideration of member election, the passage is also focused on re-articulating the past as a way of describing the present state of affairs.

In contrast, the Royal Swedish Academy of Sciences website had 10 pages focused on the organization and its goals and predominantly relied upon the Pr temporal category, emphasizing current actions and initiatives. We found instances of Pr in seven out of 10 pages (70%), while we only identified instances of P ← Pr in three out of the 10 pages (30%).

For example, the “Objectives” page for the Swedish site reads:

The Royal Swedish Academy of Sciences is an independent non-governmental organisation, whose overall objective is to promote the sciences and strengthen their influence in society. The Academy has a particular responsibility for natural science and mathematics, but its work strives to increase interaction between different disciplines.

Here, the text of the passage relies primarily upon a description of ongoing initiatives and goals. Despite describing the Academy as a non-governmental organization, the passage does not provide any further detail regarding the Academy’s specific historical situatedness. As a result, there is significantly less emphasis placed on historicization in connection with a description of the organizational structure.

Another example of the prominence of the Pr temporal category comes from “The Academy’s Organization” page of the Royal Swedish Academy of Sciences site. This page states:

The Academy meets regularly in plenary meetings to take important decisions. Responsibility for developing the Academy’s activities and making efficient use of available resources lies with the Academy Board. The President (Preses) is the chair of the Academy and leads its plenary meetings and board meetings. Three vice presidents head committees within the Academy. They as well as the President are elected to hold office for fixed terms.

Here we see that the Pr temporal category that is used in this section frames the Royal Swedish Academy of Sciences through its current hierarchical structure. When referencing prominent individuals, the Swedish site primarily makes use of position titles, such as “The President”, rather than referring to specific historical individuals who may have held the position previously. It discusses activities once again, referencing the regularly occurring “plenary meetings”.

Thus, these Academies established their objectives and organizational structure through the use of different temporal appeals. The US National

Academy of Sciences site primarily used the $P \leftarrow Pr$ temporal category while the Royal Swedish Academy of Sciences site mainly made use of the Pr temporal category.

5.2. Pages Describing Awards and Prizes

The section covering organizational goals and structure was not the only place where we saw differences in the temporal categories that were used by each organization. When looking at pages that described awards and prizes offered or sponsored by the two organizations, the two sites also differed in some notable ways. The US National Academy of Sciences site had six pages focused on awards and prizes, and a majority of those pages made use of the $Pr \rightarrow F$ temporal category. We found instances of $Pr \rightarrow F$ on three out of six pages (50%), one instance of $P \leftarrow Pr \rightarrow F$ (16.67%), one instance of Pr (16.67%), and one instance of P (16.67%).

More specifically, we see a great deal of $Pr \rightarrow F$ on the “How to Nominate” page; for example, the pages discussing award nominations are primarily focused on providing guidelines for submissions, such as “All nominations must be submitted online. Unless otherwise stated, the following materials must be submitted”. This is followed by a list of required materials or guidelines. As stated in our “Method” section, we used $Pr \rightarrow F$ both to code future actions as well as imperative sentences, drawing attention to passages that directed the audience to take a particular action in the future. This particular page included imperative instruction, keyed toward inspiring the audience to take action by submitting a nomination.

Similarly, the “Connect with Awards” page makes heavy use of the imperative tone as a way of fostering engagement with the awards process: “Join the awards mailing list to receive announcements, e-alerts, and information about the nomination process and deadlines. *Questions?* Contact us at awards@nas.edu”. Again, the emphasis on the “Connect with Awards” page appears to be primarily oriented toward fostering action on the part of the site visitors. Rather than overtly making any historical context for the awards visible, the page emphasizes the procedural nature of applying for awards.

Conversely, the Royal Swedish Academy of Sciences’ awards section contained many instances of the $P \leftarrow Pr$ temporal category. The Swedish website had significantly more pages devoted to awards and prizes than the US website: 41 pages in total. We found 23 instances of $P \leftarrow Pr$ (56.1%),

nine instances of P (21.95%), seven instances of Pr (17.07%), and four instances of Pr \rightarrow F (9.76%).

For example, the main descriptive text on the “Nobel Prizes” page drew heavily on the P \leftarrow Pr temporal category in a description of the history of this prestigious award:

By the terms of Alfred Nobel’s will the Nobel Prizes in Physics and Chemistry have been awarded by the Academy since 1901. The awarding ceremony takes place on 10 December, the anniversary of Alfred Nobel’s death. Each prize can be shared by three laureates at the most. The Laureates are announced here and at Nobelprize.org every year in mid-October immediately after they have been chosen.

Here, the Royal Swedish Academy of Sciences references the historical situatedness of the Nobel Prize. While some of the information describes procedural elements of the award, such as the nature of the annual ceremony and announcement process, it is largely contextualized by a description of the longevity of the prize.

This use of historical context when discussing awards is also present in other major pages on the Royal Swedish Academy of Sciences website. While the Sveriges Riksbank Prize in Economic Sciences may be not as well-known as the Nobel Prize, the “Prize in Economic Sciences” page introduces it through a similar P \leftarrow Pr temporal category:

The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel was instituted in 1968, at the tercentenary of the bank. The awarding ceremony takes place on 10 December, the anniversary of Alfred Nobel’s death. The laureates in economic sciences are announced and published on the Academy’s and the Nobel Foundation web sites every year in mid-October immediately after they have been chosen.

Procedural elements of the award process are also present in this passage, but the page is situated through a historical framing of the prize.

As a result, we can see two different approaches to contextualizing awards and prizes using separate temporal categories on the two websites. While each Academy seeks to promote the existence of its prizes and awards, the emphasis is different. The US website emphasizes the procedurality by using the Pr \rightarrow F temporal category, while the Swedish website focuses on the historical situatedness of the awards by using the P \leftarrow Pr temporal category.

5.3. Pages Making Use of the $P \leftarrow Pr \rightarrow F$ Category

Finally, the last notable difference in temporal categories we noted during our analysis was not situated around individual sections of the websites. Rather, we noticed that there was an interesting difference in the way each website made use of the $P \leftarrow Pr \rightarrow F$ temporal category. The use of the entire spectrum of temporalities on a single page, identified as $P \leftarrow Pr \rightarrow F$, occurred several times across each of the websites, but the ways in which it was leveraged greatly differed. On the US website, the spectrum appeared only on pages where the organization was seeking to inspire action directly related to the Academy itself. In fact, all 14 instances of $P \leftarrow Pr \rightarrow F$ temporal category on the US site were found on pages that sought action regarding the US National Academy of Sciences.

For example, we see $P \leftarrow Pr \rightarrow F$ temporal category represented on the “Giving to NAS” page:

On May 1, NAS President Marcia McNutt hosted 40 guests at the 2018 Elkan Blout Society luncheon to express her gratitude to those NAS members and spouses whose generous financial contributions have greatly enhanced our work as scientific advisor to the nation. Held during NAS annual meeting, this luncheon has become an annual tradition to recognize some of the NAS’ most charitable and loyal donors, and to welcome new members into three of our Academy giving societies: the Einstein Society, the Elkan Blout Society, and the Heritage Society.

This year’s luncheon welcomed four new members to the Einstein Society and twelve to the Elkan Blout Society. Thank you to all of our giving society members for their dedicated generous support.

If you have any questions or would like to know how you can become a member of our giving societies, please contact Mark Carter, NAS Director of Development.

In this instance, the $P \leftarrow Pr \rightarrow F$ temporal category is used to situate awareness of important events associated with the organization that represent an ongoing or cyclical investment from members of the US National Academy of Sciences. The past is visible in the description of the 2018 Elkan Blout Society luncheon that took place on May 1, 2018, while the present is invoked in a procedural overview of the event and its purposes. Finally, the future manifests in the imperative statement at the conclusion of the passage, invoking action from members of the US National Academy of Sciences.

Likewise, we see the P ← Pr → F category appear on pages for major programs spearheaded by the US National Academy of Sciences as an organization, such as on the “About Distinctive Voices” page:

Distinctive Voices highlights innovations, discoveries, and emerging issues in an exciting and engaging public forum. Do you wonder how things work? What the future holds? If you are curious about the science and technology behind today’s hot topics, Distinctive Voices is for you! Spend an evening gaining insights on significant advances in medicine, biotechnology, energy, the environment, space exploration, and more. Learn from some of the best minds in the world—including members of the National Academy of Sciences, the National Academy of Engineering, and the National Academy of Medicine—in presentations geared to the general public. Events are held in Irvine, California with videos of past Distinctive Voices events available on our YouTube channel. [...].

Distinctive Voices was created in 2006 as a program of the National Academy of Sciences Communication Initiative to increase science literacy. The program, hosted at the Beckman Center in Irvine, California receives major funding from National Academy of Sciences Arthur L. Day Fund, National Academy of Sciences W. K. Kellogg Foundation Fund and the National Academy of Sciences Frank Press Fund for Dissemination and Outreach.

The present is visible in a description of Distinctive Voices’ mission to “highlight innovations, discoveries, and emerging issues”, procedural information regarding how and where events are typically held, as well as information regarding the funding that it currently receives. The future in this passage is signaled by imperative instruction, encouraging individuals to participate in the Distinctive Voices program. Finally, the past is invoked in the second paragraph in the description of the program’s creation in 2006.

As seen on both the “Giving to NAS” and the “About Distinctive Voices” pages, which we excerpted above, the information being conveyed to the audience directly relates to programs or initiatives for the US National Academy of Sciences. The passages situate the event or initiative through a historical context, describe the present structure, and include a call to action or participation from the audience.

For the website of the Royal Swedish Academy of Sciences, however, the P ← Pr → F was almost entirely associated with position statements that

sought to evoke action from bodies beyond that of the Academy. Out of six total instances of the $P \leftarrow Pr \rightarrow F$ temporal category, five of those (83.33%) were connected to calls for action directed at institutions beyond the Academy itself.

For example, on the “Support for Ahmadreza Djalali” page, the Royal Swedish Academy of Sciences advocates for an individual while describing a current ongoing human rights crisis:

In a letter to the leaders of Iran, the Committee expresses support for the release of the researcher Ahmad Reza Djalali, imprisoned in Evin prison in Iran since April 2016.

The Committee is also very concerned about Djalali's health as he is on a hunger strike again. The Committee urges the Iranian authorities to ensure that incarceration follow UN rules for the treatment of prisoners (Nelson Mandela Rules), in particular, that he is taken out of solitary confinement, allowed to communicate regularly with his lawyer and family and is provided with all necessary medical care.

In this passage, the past is invoked by referencing Djalali's imprisonment since 2016, the present is referenced through the committee's ongoing support for this individual, and the future call to action is directed toward the Iranian government.

Similarly, on the “Concern About Developments in Turkey Regarding Human Rights and the Situation for Researchers” page, another example of the $P \leftarrow Pr \rightarrow F$ temporal category is present:

Dr. Serkan Golge, a respected physicist with dual U.S./Turkish citizenship, was arrested in Turkey's Hatay province on July 23, 2016, while visiting his parents. He is accused of membership in FETÖ, which he has denied. In the absence of reasonable evidence to support the charges against Dr. Golge, the Human Rights Committee urges the Turkish authorities to ensure that he is promptly and unconditionally released from prison.

In addition to discussing past and present events, this page again advocates for action, not from its member-participants, but from the Turkish government as a whole. In this way, each of these pages focuses on inspiring action external to the Royal Swedish Academy of Sciences as an organization and seeks to create some kind of social action in the world broadly writ.

On both of these Academies' websites, there is a clear emphasis on calls to action on pages that included the $P \leftarrow Pr \rightarrow F$ temporal category. In a sense, the two different uses of this category represent a somewhat insular perspective compared to an external orientation from the organizations as a whole. The US website remained largely focused on the activity of the National Academy of Sciences itself, while the Swedish website extended its appeals to institutions well outside the boundaries of the Royal Swedish Academy of Sciences.

6. Conclusions

In this study, we explored the websites for two Academies of Sciences, which had not been studied previously. In particular, we sought to understand how rhetorical temporality functions across the US National Academy of Sciences and the Royal Swedish Academy of Sciences.

To conduct our analysis, we created a coding scheme that captures a more nuanced understanding of the way temporality is employed in each of these sites. More specifically, we developed the temporal categories of Present (Pr), Past (P), Present-to-Past ($P \leftarrow Pr$), Present-to-Future ($Pr \rightarrow F$), and the spectrum ($P \leftarrow Pr \rightarrow F$) to emphasize that choices regarding the past and future events are often framed through the present. By employing these temporal categories, we discovered notable differences between the two websites.

Most broadly, we identified $P \leftarrow Pr$ and $Pr \rightarrow F$ were the most frequently occurring temporal categories on the US National Academy of Sciences website, and Pr and $P \leftarrow Pr$ were the most frequently seen temporal categories on the Royal Swedish Academy of Sciences. While the $P \leftarrow Pr$ temporal category occurs on both sites, there are some broadly-observed differences between the sites as well. The wide usage of $Pr \rightarrow F$ on the US site may be explained by the significant amount of imperative content present on the US site. Likewise, the emphasis on the Pr temporal category on the Swedish site may reflect the institution's focus on structure and procedural operations.

In addition to looking at the big picture, we identified several smaller sections on each website and found some interesting differences in how the temporal categories were used in two of these sections: (1) pages that

defined the organizational goals and structure and (2) pages that dealt with awards and prizes. On pages that defined the Academies' goals and structure, the US and Swedish sites differed in the temporal categories that were most frequent. The US site primarily made use of the $P \leftarrow Pr$ category, while the Swedish site relied most heavily on material that was coded as Pr. Our interpretation of these data led us to believe that this difference could be the result of a greater emphasis on structure and procedure within the Swedish site, which focused more on the current undertakings of the organization. The US site, though, relied much more heavily on appeals toward credibility established by historical figures or the longevity of the organization.

The other section that demonstrated differences in how the temporal categories were used focused on the awards and prizes offered by each Academy. In this instance, the US site relied most heavily on the $Pr \rightarrow F$ category, which could be explained by the US site's focus on imperative content—in this case, specific instructions on how to apply for certain prizes and awards. Conversely, the Swedish site focused on the historical situatedness of the Royal Swedish Academy of Sciences' awards and prizes by employing the $P \leftarrow Pr$ temporal category.

Finally, we observed a difference in how the US and Swedish sites made use of the $P \leftarrow Pr \rightarrow F$ temporal category. While this category was not associated with a singular section within the site, its implementation across both websites differed. On the US site, the $P \leftarrow Pr \rightarrow F$ temporal category appeared only on pages where the Academy sought to inspire engagement that was directly related to the Academy itself. This implementation was much more internally directed than the use of the $P \leftarrow Pr \rightarrow F$ category on the Swedish site, where the spectrum was primarily identified on pages seeking to inspire action from entities outside of the Academy. Our interpretation led us to believe that this could be due to a greater emphasis within the Royal Swedish Academy of Sciences on engagement with the international scientific community.

We believe that the coding scheme we developed could be useful for conducting research on scientific Academies representing other countries. More specifically, our next step is looking at the scientific Academies of Russia and China so that we could extend the body of analysis beyond Western institutions in order to determine how rhetorical temporality may be used across a more diverse sample of Academies. While we believe the differences we identified above are meaningful, more research is needed in

order to determine the full scope of how rhetorical temporality is used within the websites of scientific Academies, which serve as sites of professional communication.

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Olga Menagarishvili (PhD, University of Minnesota) is Assistant Professor in the Department of Technical Communication and Interaction Design at Metropolitan State University in St. Paul, Minnesota. She has also taught technical, scientific, and professional communication at Georgia Institute of Technology in Atlanta, USA, the University of Minnesota in the Twin Cities, USA, and the Royal Institute of Technology in Stockholm, Sweden.

Bret Zawilski (PhD, Florida State University) is a Lecturer in Critical Skills at Maynooth University in the Republic of Ireland. His research interests revolve around multimodal composition and digital circulation, and he has also taught courses in professional communication, rhetorical theory, and scientific rhetoric.

