Astronomical Discoveries – A New Rhetorical Genre

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Announcements of scientific discoveries have a certain language and observable pattern to them. In the world of rhetorical criticism, the set of patterns and language that classify a particular artifact is known as the 'genre' that it falls into. The most recognizable rhetorical genres people are familiar with are the eulogy and the public apology, but these two categories only scrape the surface of what a rhetorical genre can be. Classifying a piece of work into a pre-known genre requires looking at a number of works within that genre and then showing how the new artifact conforms to their patterns. In this paper, I plan to discuss the announcements of astronomical discoveries as works of rhetoric, but *not* by arguing that they belong in a pre-existing genre; rather, I think the patterns that make up these astronomical announcements are unique enough in the world of science to comprise their *own* genre. First, I will outline what a good argument for this new genre ought to look like before proceeding to defend my position according to the outline.

In order to argue for a new rhetorical genre, we must define 'genre'. According to Sonja Foss's book on rhetorical criticism, rhetorical genres are "ways of recognizing, responding to . . . and helping to reproduce recurrent situations." Artifacts in a genre must also share situational similarities and "substantive and stylistic characteristics" (Foss). This means that to be members of a genre, artifacts must share similarities of content and circumstance – in other words, the rhetorical situation that calls for something to be said must not be a one-time thing, it must be recurring. In order to prove that there is, in fact, a genre of astronomical discoveries, we need to prove that there is an identifiable pattern that these announcements follow and that the situation that they respond to is a recurring one.

I have chosen a few key astronomical announcements that ought to be compared to one another in order to form a valid argument for a rhetorical genre. The first artifact is Michel Mayor and Didier Queloz's announcement from 1995 about their finding of a planet from a different solar system – the first one ever discovered (Mayor). The second artifact is B. P. Abbott et. al's announcement of the detection of gravitational waves in 2016, a phenomenon predicted

by Albert Einstein about a hundred years before (Abbott). The third artifact that we will examine is the announcement of our universe's acceleration, discovered by Adam Riess and a host of other astronomers in 1998 (Riess). The last artifact is an announcement a little less targeted towards the general public and a little less important and therefore necessary for our study (our observations would be incomplete if they featured only the announcements to non-astronomers, for those could be often very different from those aimed at the astronomic community): the discovery of the first Be/BH (spectral type Be star / black hole) binary system discovered in 2014 by P. Munar-Adrover and a few other scientists (Munar-Adrover). Using these four examples, I will outline what they have in common both in language and situation and what rhetorical methods they use to address these issues. Finally, I will produce criteria and justification for a new rhetorical genre of astronomical discoveries.

The language of our first artifact, Mayor and Queloz's disclosure of the planet they found orbiting 51 Pegasi, is astronomical and scientific but not so elite that I (an arts and sciences student taking astronomy 103) could not understand it. They opened their paper by explaining their main area of research (measuring the radial velocities of stars) and then talk about the error involved in radial velocity calculations and how that relates to finding planets around other stars. Essentially, because of the limitation of current equipment, nothing smaller than Jupiter has a chance of being seen (Mayor). They then tell how long they've been observing the star-planet system they claim to have found, and they immediately acknowledge the trouble with believing their analysis: in our solar system, all the most massive planets are far from the sun and composed largely of ices and gases. Because of this, science up till then had hypothesized that no planet around the size of Jupiter was capable of forming as close to as star as, say, Mercury is to our sun. However, the planet Mayor and Queloz found orbited 51 Pegasi at 0.05 AU (Mayor). The scientists found themselves in a situation where the logic of their findings challenges modern knowledge, and yet they found no error in either their observing or hypothesizing about the data (Mayor).

This rhetorical situation – having confusing news that adds to collective knowledge of our universe but might also send astronomers back to the drawing board regarding the formation of Jovian-size planets – requires a certain amount of rhetorical skill to navigate. How do you

show firm belief in your findings without antagonizing the colleagues who have worked hard on and believed in theories you are now questioning? Mayor and Queloz proceed with great humility, starting with a summary of their findings and conclusions, admitting that they are strange, and then lay before the scientific community everything they have observed and calculated as well as how they came to the conclusions they did. This way, no nay-sayer can downplay their methods from afar, and contenders must contend with everything the two Swiss astronomers found. This shows a great amount of tact and also a great amount of care for the subject matter. They were not afraid of where the data lead and they followed it, and even though they are not where they thought they would end up, they believe they have come to the right conclusion and they are ready to defend it while also ready to speculate (as they do at the end of the article) about the real nature of the planet orbiting so close to 51 Pegasi (Mayor).

Our second artifact, Abbott's detection of gravitational waves, was far less controversial and far more exciting because the existence of such waves had been theorized by the greatest physicist to ever live - Einstein. They open the article with reminding astronomers (needlessly, but to good effect) of the dates and importance of Einstein's prediction followed by a reminder of the works and equations of Schwarzchild and Kerr regarding black holes (Abbott). In this way, they establish how their discovery builds off of and finally confirms influential theories. Yet they too go through every step of how the discovery was made, even going back and describing the history of the search for gravitational waves before moving ahead and describing the observations with every specific of date, time, location and machinery (Abbott). Colorized graphs accompany every claim, and step by careful step they reveal the merger of the black holes - an event big enough to produce undeniable (not to mention highly detectable) waves in the gravitational field (Abbott). The conclusion of the announcement is as straight-forward and proud as it can be without bursting into joyous song:

> "The LIGO detectors have observed gravitational waves from the merger of two stellar-mass black holes. The detected waveform matches the predictions of general relativity for the inspiral and merger of a pair of black holes and the ringdown of the resulting single black hole. These observations demonstrate the existence of binary

stellar-mass black hole systems. This is the first direct detection of gravitational waves and the first observation of a binary black hole merger." (Abbott).

Even when every discovery was long-awaited, the announcement of this astronomical discovery still followed the format of the first announcement, with an opening, a complete disclosure and careful explanation of every piece of data (not to mention the limitations and capabilities of the available technology). Regardless, then, of the discovery's odds of acceptance, it appears that the announcements *still have the same traits*, indicative of a distinct genre.

I find it necessary to interject here that I am not unaware that most scientific discoveries follow these procedures of disclosure regardless of whether or not they have to do with the skies. However, there is a major difference between astronomy and sciences that deal with things here on Earth because of the unimaginable distance, the amount of creative speculation necessary to propose theories at all, and the inability of the watchers to control much other than how and to what degree they observe. This makes it even more necessary that every astronomical discovery show every bit of data, methodology and insight before acceptance. Also, it is often the case that different countries do not have the same types of equipment needed to verify the research of others. In the case of a chemical discovery, most labs have the exact same capabilities as every other, meaning that if you don't believe someone's observations, you can attempt the experiment yourself. When given access to a one-of-a-kind telescope or other data collector, astronomers must therefore keep *perfect* record of how they use it because the likelihood that every colleague can test their findings is very slim. This means that with every announcement there must be more inherent trust from the audience and therefore more detailed disclosure to begin with.

We can now go back to the main analysis by looking at the third artifact: the discovery of the acceleration of the universe (Riess). Here again we find an artifact that holds information contradictory to prior speculations and therefore one which must do a better job justifying itself to the astronomers and the public (for this discovery has implications for what we believe about the beginning of the universe, a subject touched on in every high school). This is by far the longest and most thorough of the papers, being about 30 pages in length including citations and a healthy number of charts (Riess). It is not, however, the easiest to read for someone of my experience, which is as it should be considering its importance. Again, all data collected is

shown and all conclusions are discussed in great detail – it should also be noted that this paper was a work compiled by no less than 20 scientists (Riess). The rhetorical situation for this particular paper was a series of ongoing arguments that had to do with the observed past of the universe up until this point; astronomers debated among each other about whether the universe would continue at its present speed for a long time yet or if it would start slowing down to the point that it would implode. The idea that the universe was accelerating was not even on the table. But the work of Riess et al dashed these arguments, well-formed though they be, to pieces. This situation is even more interesting to observe than the first for the stakes were much higher to begin with. While astronomers and some of the public are happy to hear of the existence of a planet orbiting a different star, the acceleration of the universe is something that touches many more sciences and many more interests. Therefore, these men were writing (and knew that they were writing) for the eyes of the world. And they followed *the same patterns:*

- scientific language though not impossible to understand given basic knowledge and time
- a full disclosure of all data
- an extensive discussion of the implications of their conclusions.

These genre tropes also apply to the less world-shattering announcements. In this last example, our group of astronomers were more excited to share their research because it was not unexpected and it actually "solves the problem of the missing Be/BH binaries (Belczynski & Ziolkowski 2009) and opens a window to study the behavior of Be/BH binaries compared to Be/neutron star binaries" (Munar-Adrover). Yet these scientists follow the same structure as the ones in our other artifacts; they give the background for their research, they show everything they found, they list their conclusions and then have an added a discussion, much like the speculations at the end of the first artifact, wrapping up what they have seen and what it adds to the scientific community. Again, the language, while technical, is not completely impossible for a person with a basic knowledge of astronomy to read, and therefore while this article may be of most interest to astronomers, it is also available to a more public audience. The rhetorical situation presenting this announcement is fairly different from the last, and yet the writing still

follows a lot of the same patterns of introduction/summary and justification of conclusions by laying all the facts on the table.

Through these rather brief summaries of a few different kinds of astronomical discoveries, we can see that there are, in fact, patterns that are called for and copied by the recurring rhetorical situations. In all of these cases, something extraordinary was found that either greatly aided the astronomic community at large or that challenged many notions and set the astronomers to contemplating what they had never contemplated before. The understanding of the world of astronomy is more accustomed to upheaval than any other scientific field, and because of this, new discoveries – *especially* the surprising ones – are absolutely vital to the science. In other fields, scientists are fairly comfortable with what they know and ask only what they can do; astronomers will always be seeking to simply know. This is why their announcements of new discoveries deserves a genre of its own; their rhetorical situations are different, their methods are different, and the reception of strange findings are different. These things satisfy the categories of similarity necessary for a genre in rhetoric, and therefore they comprise a unique genre even within the study of science.

Citations

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