

Authority in Digital Space: Exploring the Case of the Green Pea Galaxy

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## **Abstract**

The Green Pea Galaxy was discovered by a group of Zooniverse discussion forum users in 2007. This dissertation investigates the rhetorical moves and motives of the discussion forum users who discovered the galaxy and how those non-expert users constructed authority and expertise within the discussion forum to develop criteria for assessing their own discovery outside traditionally trained experts.

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## **Chapter 1: Authority and Expertise in the Digital Age**

*“All the scientist creates in a fact is the language in which he enunciates it.” —*

*Henri Poincaré*

In 1632, Galileo Galilei published his famous treatise, *Dialogue Concerning the Two Chief World Systems*, in which he argued that the earth revolved around the sun and not, as had been believed by many, that the universe revolved around the earth. In his famous work, Galileo offered a radically new understanding of the place of humanity in the universe: heliocentrism. Despite Galileo’s authority as a scientist in the seventeenth century, his work was condemned by the Catholic Church, and he was convicted of heresy by the Inquisition, which forced him to recant. It is now considered general knowledge that the earth revolves around the sun, and the solar system is but a single and tiny speck among the infiniteness of the universe; however, in the seventeenth century, this idea was terrifying and burgeoning. Galileo’s authority on this subject was only confirmed in retrospect. As other scientists investigated the idea of heliocentrism, Galileo was proven correct, and his status as one of the greatest scientists of the seventeenth century was solidified.

Today, it would seem intellectually blasphemous to discount Galileo’s authority. His authority is cemented in both historical context and scientific method. The evolution of Galileo’s observation from heresy to fact is one drawn across centuries of observation, testing, and exploration. Despite this, Galileo’s authority was not enough to save him from the Inquisition and from being put under house arrest for the remainder of his life.

This example of unrealized authority and retrospective authority provides a useful backdrop to understanding the complexity of authority and, perhaps most importantly, who is allowed to be an authority and enact authority. The example of Galileo is an old one but still relevant. We place a lot of trust in experts and those who claim to be authorities on subjects. Still, challenges to authority and expertise frequently occur. For Galileo, he was challenging an enormously powerful institution that based its existence and interpretation of the world on the Bible. Galileo could likely not have conceived of the internet or its speed and reach across the world, but he could likely have understood the challenge to authority in the face of overwhelming evidence.

Despite the influence of many renowned intellectuals, scholars, and scientists since Galileo's time, there are other examples of the nebulousness of authority. In some instances, authority is granted to a person based on their position rather than their knowledge and expertise. For example: Some members of the Anti-Vaccine Movement (anti-vaxxers) rely more on the authority and "expertise" of the self-selected group they enter rather than medical professionals. Anti-vaxxers seem to not be swayed by argument or expertise, and, instead, they build an insular community that reinforces its own authority through intuitive experience. Anti-vaxxers seem to distrust science and ignore flaws in their thinking in order to justify their position. In this case, overwhelming scientific evidence is ignored rather than challenged in the same way as Galileo's case<sup>1</sup>.

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<sup>1</sup> The phenomenon is often referred to as "confirmation bias," or a logical fallacy in which one's perspective becomes entrenched despite evidence to a contrary position. See Margit E. Oswald

These are two extreme examples that represent two ends of a spectrum, and they illustrate the confusing and haphazard nature of authority in different contexts. This dissertation is primarily about the construction of authority and, by extension, the process of becoming an expert and how these issues play out in digital spaces. We might look back on the example of Galileo and immediately recognize his authority and expertise, but, during his lifetime, he was not recognized for such attributes by everyone. Similarly, we might look at the example of anti-vaxxers and consider the insular nature of authority and expertise within a specific community, but that does not also mean we must recognize or acknowledge such false authority or expertise.

In this dissertation, I examine the rhetorical moves within one case to help answer the question of how expertise is constructed among nonexperts<sup>2</sup>. Like all research, this dissertation is born out of a story. In Chapter 2, I write out my case narrative, which provides a detailed story on the how, why, and when of the discovery of the Green Pea Galaxy (GPG) and the Zooniverse platform; however, my case narrative is only focused on the official case for my current research project: It is not a complete accounting of my drive for the topic of authority and expertise. For that, let me offer a short anecdote.

I doubt many would argue that the first authorities and experts we meet in our lives are those within our own families. For some, mother is god, father is god, and the universe exists because they say it does. As a child, I believed that

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and Stefan Grosjean's chapter "Confirmation Bias" in *Cognitive Illusions: A Handbook on Fallacies and Biases in Thinking, Judgement, and Memory* edited by Rudiger Pohl.

<sup>2</sup> I articulate my research questions in Chapter 3.

my parents always had the answers. It did not matter what questions I asked: My parents had the answers. Of course, as one matures, you learn that everyone is fallible, and your parents will not always have the answers. Indeed, the first time I realized I knew more about a topic than my parents was mind-shattering. I asked my father a question, and he clearly did not know the answer. That realization altered my view of the world and of him.

As a child, I built my first computer with my grandfather. The first program he gave me for my newly built computer was Microsoft Encarta, which was an encyclopedia program. For years, Encarta was the go-to computer program for accessing knowledge and learning new information. My family could not afford an *Encyclopaedia Britannica*, but we could afford a computer program. I spent hours on the computer learning about various aspects of the world that changed my perception of how the world works. I recall asking my grandfather, why I should trust the information in the program? He did not have an answer, and, in retrospect, I suppose the question was rhetorical in nature, but it provided me the first glimpse into why I am interested in authority, expertise, and the internet. Encarta eventually became outdated, and the source of encyclopedic knowledge moved to Wikipedia<sup>3</sup>. Still, whenever I consider the authority of a situation or topic, I always think about Encarta and how we know that digital information is or is not trustworthy.

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<sup>3</sup> This is only a personal anecdote. I recognize that there is considerable scholarship on encyclopaedias, including a 2019 article by a member of my dissertation committee: "Dictionary vs. Encyclopedia, Then and Now" by Michael Hancher in *Dictionaries: Journal of the Dictionary Society of North America*.

I offer the above anecdote as an example as to why I am interested in my current topic, but I also offer it because it shows that the same issues that affected Galileo did not die with him. Why should I trust the information I receive? How can I build authority to speak on a topic? These are old questions that predate Galileo. The question of authority (ethos) is well-worn among classical rhetoricians, like Aristotle and Cicero. Further compounding the question of authority is the nonhierarchical design of the internet. Anyone can use the internet and anyone can create an identity and persona through which to navigate and interact on the internet. In a *New Yorker* cartoon, Peter Steiner famously suggested, "On the Internet, nobody knows you're a dog." Steiner's observation continues to be relevant, and it suggests that identity, authority, and expertise is based in the rhetorical functions of the internet. We build our identities through language, and we construct authority and expertise through language. The contemporary internet is similar to the early internet in this way. Whether it is 1995 or 2020, we still use language to position ourselves in digital spaces.

### ***Ethos and the Internet***

Most contemporary understandings of ethos derive from Aristotle's three appeals: logos (appeal to logic), ethos (appeal to authority), and pathos (appeal to passion). Aristotle suggested that ethos is inextricably connected to an audience because a speaker or rhetorician needs to build a rapport with an audience to build authority. Ethos "make[s] the speaker worthy of credence" (1.2.4). Ethos makes the speaker and the writer credible, and it is credibility that

ensures a message is trusted. Cicero emphasized ethos in arguing that an orator must have knowledge of the facts; an orator must know something about a topic to speak on that topic (1.13). For both Aristotle and Cicero, knowing something about a topic is critical. In order to build authority, a speaker needs to have knowledge of a topic and needs to be able to convey that knowledge. These dual qualities are imperative for both Aristotle and Cicero; however, a speaker can succeed in building authority by simply making an audience believe the speaker is credible (Baumlin xv). That does not mean that a speaker must have legitimate knowledge or credibility but only that an audience believes those attributes exist within the speaker. This type of ethical appeal (or appeal to authority) continues to operate in the twenty-first century.

The internet is composed of digital spaces through which users interact. These digital spaces serve different communities and issues. The move from face-to-face to online communication complicated communication practices among humans. Scholars have investigated these complications, including how the internet and computers affect gender (Herring), social cues (Hiltz and Turoff), community (Galegher, Sproull, and Kiesler), and emotion (Rice and Love). These scholars have offered a picture of the internet that reinforces the problems of authority-building in digital spaces. Such spaces lack the types of interactions, such as body language and tone, that help humans better understand the goal and focus of a message (Ferrara, Brunner, and Whittemore). All these issues complicate the construction of authority, but, importantly, all these issues take

place within specific spaces on the internet. The role of space also influences ethos.

Identifying with a topic and with a contextual location can help develop a speaker's identity. Marshall Alcorn makes a similar observation: "Different social situations trigger different self-structures," which is an important consideration in contemporary communication spaces (5). The imperative of space becomes clear when we consider the location and construction of authority as a negotiation between a speaker and audience. Furthermore, the authority of a space lends its credibility to those within it, and a speaker's authority "cannot be determined outside of the space in which it was created or without a sense of cultural context" (Reynolds 329). The internet may be nonhierarchical, which has given rise to diverse and diffuse communities, but the structures within those communities are still subject to many communicative practices in analog spaces.

The internet was designed to be nonhierarchical, and, as such, it allows users to construct and develop authority and, later, expertise based on their experience. The internet flattens access to knowledge and provides a forum for users to negotiate their positions. In a similar way, the internet also flattens authority because once secluded information may no longer be so, and users can access that information outside of traditional knowledge structures and, potentially, become experts without the traditional training reserved for such. For example: Some internet users seek out medical knowledge sites, like WebMD, and self-diagnose their own potential illnesses. These users consume the information on said sites without the benefit of training or medical ability. Still,

within communities, users cannot accept a message based solely on content: authority and tone need to be equally interrogated (Gurak, "Persuasion and Privacy" 84), while the flattening effect of the internet can lead to the depersonalization of communication and make the computer an audience rather than the human behind the computer (Kiesler, Siegel, and McGuire 1125).

Given the rising assaults on authority and expertise by internet users and political figures alike, the topic of this dissertation is important to not only contemporary communication but also to future communication. The ways in which we trust information are ever-changing. How does one build authority and then what is the process toward expertise? These questions are central to discourse communities and knowledge practices across the intellectual and political spectrum. Our relationships with medical professionals, journalists, and other domains that were once ruled by experts are no longer as they once were. Citizen journalists, citizen scientists, and others now post raw information to the internet and interpret that information without the benefit of training or deep experience.

Higher education is partly to blame for the flattening of authority and, by extension, expertise because it is responsible for producing experts and also responsible for producing consumers of expertise (Geisler 82). The production of experts and the consumers of expertise blurs the lines between authority and expertise. Some people cannot always distinguish between what they know and what they do not know. The difference between authority and expertise may be in the ability for some to maintain long term training and re-evaluation (Posner xxxv)



coupled with making quick and confident judgments. Confidence in judgment and accuracy reinforce authority and expertise because experts depend on evidence and use evidence in establishing and maintaining authority and expertise (Johnson 210-212).

Within specific spaces, interaction can aid the development of expertise. Any location where the language of expertise is used by nonexperts provides an opportunity for negotiating knowledge (Norgaard 48-51), though the collective use of knowledge as expertise and not simply authoritative may still be the domain of a privileged few (Hartelius 518). The flattening effect of the internet ensures that anyone can participate but not that anyone will be trusted and believed.

### ***Crowdsourcing and Knowledge***

The speed and reach of the internet coupled with its flat structure encourages certain behaviors and access (Gurak, "Cyberliteracy" 30); however, speed and reach are not always conducive to the construction of authority. The internet was conceived as a sort of "man-computer symbiosis." J.C.R. Licklider offered that such symbioses are meant to serve humanity, but they also cannot be the end game in understanding the technological ramifications of the tools and networks that would eventually coalesce into the internet (4-7). Douglas Engelbart refined Licklider's concepts in arguing that digital technologies would afford users the ability for near instantaneous collaboration and, as such, would augment human intellect. Humanity would no longer be restricted to the computer within their heads but would have access to the collective

consciousness of connected nodes and networks (1-5). At the time, the internet revolutionized the idea of communication as it was known, and the possibility that communication would be more successful via computers rather than physical meetings promised to alter the future of work, learning, and a host of other aspects of everyday human existence (Licklider and Taylor 21).

As Engelbart suggests, the beginning of the internet was about communal knowledge. This belief in the supremacy of socially constructed knowledge has inspired and given rise to numerous collective knowledge projects through crowdsourcing. Indeed, a rhetoric, scientific, and technical communication (RSTC) scholar conducted one of the first investigations into an internet-based crowdsourced movement (Gurak, "Persuasion and Privacy"), so researchers continue to ask questions about how the nonhierarchical nature of the internet enables knowledge practices and affects change across digital spaces.

The reason to crowdsource a project is dependent on the initiator. In an etymological analysis of definitions, Enrique Estellés-Arolas and Fernando and González-Ladrón-de-Guevara analyzed and refined various definitions of crowdsourcing into "...a type of participative online activity in which an individual, an institution, a non-profit organization, or company proposes to a group of individuals of varying knowledge, heterogeneity, and number, via a flexible open call, the voluntary undertaking of a task" (197). Crowdsourcing is inherently about problem-solving, and it depends on outsourcing large amounts of work to willing participants (Schenk and Guittard 94-95). A problem is offered to a group of

people (the crowd), and those people are invited to help solve the problem (Ghezzi et al 354-355).

Yuxiang Zhao and Qinghua Zhu suggest that crowdsourcing projects tend to fall into three research focuses: conceptualization focus (exploring the root of crowdsourcing), system focus (exploring the relationships between participants in crowdsourcing), and application focus (exploring where crowdsourcing can be used). These focuses are dependent on what the research project initiator wants the project to accomplish (420-425). The broad categories of crowdsourcing mimic, in a way, the flattening of authority on the internet. Anyone can participate in a crowdsourced project in the same way as anyone can access the internet. The barrier to participation becomes much lower because of the internet and the digital spaces in which users coalesce.

The problem-solving potential for crowdsourcing is an attribute that has the potential to affect pressing social, cultural, and scientific issues on a large scale (Brabham 75-76). This type of collective effort can lead to the discovery and dissemination of knowledge, and it can transform different fields of inquiry through mass collaboration. Indeed, the access to knowledge and potential for transformation make crowdsourcing an excellent candidate for distributed computing projects that aim to answer scientific questions (Rheingold 168-169) and to produce knowledge through user-generated text (Kress 23-24).

### ***Rhetoric and Science***

Since the 1980s, rhetoric scholars have examined the rhetoric of science (Fahnestock; Gross; Lyne; Melia; Prelli). Such examinations have typically been

along historical lines and focused on specific cases or individuals within scientific discourse. While I use rhetorical analysis to examine authority and expertise, my dissertation is not directly concerned with nor in the heritage of the rhetoric of science. I am not investigating how specific scientists (e.g., Galileo) use argument (Moss) or how a scientist's (e.g., Darwin) arguments evolved over time (Gross "Starring the Text").

Instead, my examination of authority and expertise takes up broader concerns than that of some rhetoric of science literature, which often focused narrowly on specific concerns. For example: Jeanne Fahnestock focuses on the specific use of figures and style within scientific discourse. This narrow focus is at the expense of other issues, such as authority. Although it amounts to a substantial field of inquiry, rhetoric of science is not directly related to my research. If anything, rhetoric of science might be adjacent to my work, but it is only so in that there are similarly relevant questions of authority.

Still, there is some work from the rhetoric of science and social studies of science that can help inform my research and study. The combination of authority-building and crowdsourcing, especially within knowledge projects, lends itself to scientific inquiry. Bruno Latour and Steven Woolgar examined the construction of facts and authority within scientific systems and concluded that facts and authority are socially-constructed and agreed upon through conversation (154-166). Latour and Woolgar's case study was significant but not surprising. As discussed earlier, authority is socially-constructed through language, and issues of science are never only of science; such issues are

dependent on language and discussion within whatever system of facts and authority exists to evaluate them (Polanyi 194-203).

Some scientists are loath to admit that their work is socially constructed rather than only observed and reported, though they may admit that “the process of writing and revision...has an important consensus-building function” (Myers 98). The work of observing, recording, and then analyzing scientific phenomena provides an opportunity for scientists to articulate a position in relation to knowledge. This position is one based in authority, and for scientists, authority is built on consensus of claims that are accepted by members of a community (Myers 257-258). Michael Halloran suggests that the ability to make claims within the scientific community is dependent on the speaker’s authority, and such authority sustains the entire scientific paradigm (78-79). The construction of authority becomes critical to establishing and maintaining a position within a community that thrives on expertise.

Science and rhetoric are both concerned with knowledge. The construction of authority revolves around who is allowed to articulate that knowledge. Rhetorically, science is a community constructed around experts and then reinforced through the systematic observation and analysis of information and, then, the persuasion of others within that community (Gross 6-7). Although some scientists may claim they only report and do not persuade, in fact persuasion is at the center of the construction of their (scientific) authority. Finally, Lawrence Prelli argues that scientific rhetoric always works to reduce ambiguities in understanding, and, through this reduction, scientists can build

authority (144-146). Prelli shows that a scientist's argument will be accepted as true if the method and observation for that argument is sound or accurate (199). Accuracy in method and observation is critical to entering a community and attaining expertise. While authority-building in scientific rhetoric is based on accumulation of knowledge, expertise is attained through the articulation of experience and the application of that experience to various issues, and, through that articulation, scientists may hedge and employ metadiscourse to signal a certain amount of certainty (Geisler 11-15).

### ***Chapter Summary***

In this chapter, I have provided a review of some of the concepts and literature necessary to understand my focus on authority in digital spaces. Analyzing a digital space in which a scientific discovery is paramount draws on the theories and research of authority, crowdsourcing, and rhetoric of science. The combination of these three areas provides a solid foundation on which to consider the construction of authority and, by extension, expertise within a specific case.

In Chapter 2, I provide a case narrative for the discovery of the Green Pea Galaxy. I will discuss the founding of Zooniverse, issues that surfaced within the discovery forum, and how nonexpert users discovered a new type of galactic object. I will also explore the theoretical and practical foundation of case study research.

## **Chapter 2: The Discovery of the Green Pea Galaxy**

In 2007, a group of Zooniverse participants discovered a previously unidentified galaxy. The galaxy was spherical and greenish in appearance. The lay researchers who discovered the galaxy affectionately described it as a pea. In Chapter 4, I demonstrate and highlight the playful exchanges participants engaged in as they searched for ways to describe the galaxy. What those discussions will show is a keen understanding of how to navigate and monopolize a knowledge forum in ways that build authority and value localized expertise.

The discovery of the galaxy marked a confluence of attributes that created the perfect space for lay researchers to discover, identify, and build on a galactic phenomenon rarely seen before. It is safe to suggest that such a discovery would not have been possible without the internet, but, more specifically, it would not have been possible without the creation of an online space designed exclusively to encourage the exploration of the data from the Sloan Digital Sky Survey. The design and implementation of an online space provided participants from across the globe an opportunity to informally contribute to scientific research.

While this dissertation is not explicitly about scientific research, it is about how online spaces encourage and contribute to the identification and spread of knowledge. However, there are certain aspects of interest in considering the overall case of the galaxy discovery, including the design of the online space in which the discovery occurred; the source of data for the discovery and the goal of providing said data; and the initial reaction to the discovery of the galaxy. In this

chapter, I offer a case narrative that weaves together the background contributing to the discovery of the Green Pea Galaxy (GPG).

### ***The Galaxy Zoo and Zooniverse Platform***

Galaxy Zoo project was founded in 2007 in response to the deluge of astronomical data that resulted from the Sloan Digital Sky Survey, with the goal of recruiting volunteers from across the globe to aid in scientific classification. Two University of Oxford scientific researchers, Kevin Schawinski and Chris Lintott, initially devised the Galaxy Zoo project. They were presented with a quandary. They had far too much survey data for only them to identify and categorize. Schawinski classified around 50,000 galaxies himself over a seven-day period, and he reported the process as “mind-numbing” (McGourty).

The project provided a unique experience for participants in that the images produced by the survey were likely to have never been seen by human eyes. When a participant logged on to classify a galaxy, they were probably the first human to see it. This was an astounding endeavor, and it offered researchers extra unpaid collaborators (McGourty). The idea of thousands of volunteer research assistants is strong enough to make any scientist a project believer.

The success of Galaxy Zoo eventually led to a larger umbrella project: Zooniverse. Galaxy Zoo was moved under the Zooniverse platform, which expanded the number of smaller volunteer-powered projects available. Galaxy Zoo was one project, but Zooniverse’s platform enabled numerous other projects to be undertaken. As of 2020, Zooniverse has 101 active classification projects.



These projects are not limited to scientific research. Projects range from science to art to literature to history (“Projects”). The range of projects is impressive but even more impressive are the thousands of active volunteer participants from across the globe crowdsourcing classification research. Average people contribute to the process of research, contributing to the importance of research and higher education in everyday life.

Any researcher with abundant data that needs to be characterized can now use the Zooniverse platform. Zooniverse welcomes researchers to update their data and then set the parameters of their expectations. Researchers can articulate what they need help with and then ask volunteers to complete the tasks set forth (“Build a Project”). Most of the active projects on the Zooniverse platform were initiated by researchers outside of the original Galaxy Zoo project.

The success of the platform is shown in what it has produced. As previously mentioned, there are 101 active projects on the Zooniverse platform, and there are 31 completed projects (“Projects”). This means that 31 research teams received assistance with classification of their work from thousands of volunteer participants to an extent that those researchers were able to complete their projects on the platform. The significance of the platform is attested to by the number of publications written with the aid of the data from Zooniverse. With the aid of Zooniverse research, over 100 scholarly publications have been written. The content of the publications is as diverse as the projects ranging from science to art to history. There are even numerous meta studies published based on Zooniverse research (“Publications”).

The plethora of items that owe their existence to the Zooniverse platform is impressive. However, despite the impressive nature of the platform, Zooniverse achieves in function nothing more than a system of classification built aside simple discussion-based forums in which participants discuss unexplained phenomena from the active projects. The simplicity of the system is the platform's greatest strength; it enables participants from around the globe to contribute through a technological affordance like a classic and well-established computer bulletin-board system. In adopting a simple classification and discussion system, Zooniverse partly ensured the success of the projects. This system is still working and is still recruiting volunteer participants to the active projects on the Zooniverse platform.

### ***The Sloan Digital Sky Survey***

The focus of this dissertation is the original Galaxy Zoo project and, specifically, the discovery of a certain phenomenon. The data for the Galaxy Zoo project was drawn from the first Sloan Digital Sky Survey, which functioned from 2000 to 2008. There have been several other sky surveys following the first survey, but the discovery of the GPG occurred during the timeframe of the first survey. Since the first Sloan Digital Sky Survey, there have been 16 published data releases from 2000 to 2020 ("Sloan Digital Sky Surveys"). The continuing effectiveness of the sky survey and its data releases provides scientific researchers an ever-updating resource with which to conduct their research.

The Sloan Digital Sky Survey photographed large areas of the night sky to capture images of galaxies. There are billions of galaxies in the observable

universe, and the sky survey collected photographic data for the purpose of classification and analysis. The first sky survey operated from 2000 to 2008. During this period, the sky survey photographed the night sky and uploaded the data to their website (“Science Results”). The data was made available to any researcher in need of it. The Sloan Digital Sky Survey intended to take advantage of the affordances offered by the internet. This intention was the same as that for earlier distributed computing efforts, like SETI@Home (Phillips).

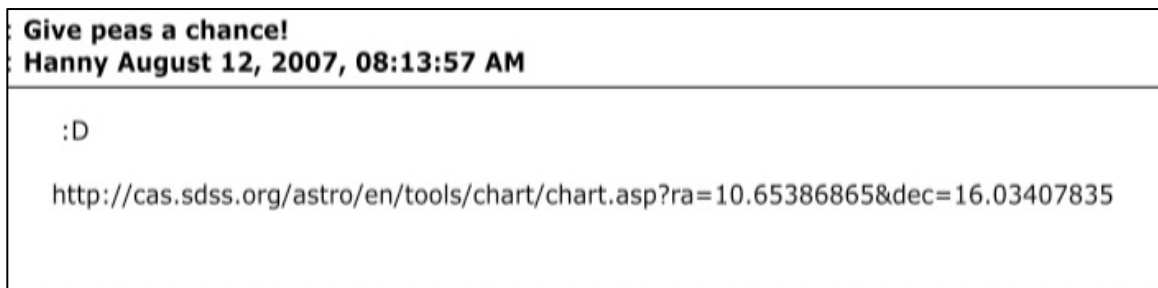
The telescope for the Sloan Digital Sky Survey was designed specifically for the sky survey. The planning for the sky survey began in the 1980s, and with the advent of newer and better technology, researchers were able to design a telescope to achieve their demands. The telescope, which was housed at the Apache Point Observatory in New Mexico, was designed to conduct “a wide-area, multi-band imaging survey of a substantial part of the celestial sphere, and to create spectroscopic galaxy and quasar samples that exceed existing ones” (Gunn et al. 2).

The Sloan Digital Sky Survey provides cumulative data on its website. Any researcher can make use of the cumulative data of the sky survey; however, the effort required of such use is staggering. The greatest success of the sky survey data is in its use in other research projects. While Zooniverse has provided a method for volunteer participants to interact with the sky survey data, over 7000 publications have been written using data for the Sloan Digital Sky Survey, and the data from the sky survey is used in other distributed computing projects, including MilkyWay@Home (“Science Results”).

The data from the Sloan Digital Sky Survey is critically important to many projects, including projects hosted on the Zooniverse platform. The sky survey continues to be a source of scientific discovery. The future of the sky survey includes expanding telescope capabilities to be able to view the entire night sky from all regions of the globe providing data for current and future researchers for generations (“The Future”).

### ***The Green Pea Galaxy***

On August 12, 2007, a Galaxy Zoo forum participant posted a link to a Sloan Digital Sky Survey image. The user labeled the discussion thread as “Give peas a chance!” (see Figure 2.1). The user had stumbled upon a unique and unidentified phenomenon. The phenomenon existed outside the established classification criteria used for various other galactic phenomena provided by the Galaxy Zoo project and Sloan Digital Sky Survey.



***Figure 2.1***

With a playful emoji, the forum participant provided evidence of a newly unclassified galaxy. It is arguable whether such discoveries are inherent to rather mundane circumstances, but the nonexpert status of the participant is critical to understanding the role of fact-building and expertise, which I explore in my Chapter 4 analysis.

The common vision of a university educated scientist toiling in a lab before discovering some great and new knowledge is squarely overturned by the Zooniverse platform and the discovery of the GPG. The participants were to classify galaxies based on known classification criteria. The project researchers assumed that nothing new would be discovered by project volunteers. However, the first seven days of the forum thread evidences strong interest in the discovery and the classification problems it presented.

After the initial forum post, other forum participants began a playful back-and-forth, musing on the idea of peas as a classification. The galaxy does look like a pea to the human eye, or, at least, the galaxy assumes a roundly shape and green-hued color (see Figure 2.2).



**Figure 2.2**

The discovery of this new galaxy produced a bevy of jokes and musings exploring how many different ways the idea of peas could be applied to the image. The jokes about peas continued until the closing of the discussion thread in 2014. The month of the discovery—August 2007—was particularly rife with humorous anecdotes and identifications. The first few responses to the initial posting produced the type of humor used throughout the thread, and those responses highlighted the prevalence of “Awful Jokes” and a topic thread that existed simply for posting these jokes (see Figure 2.3).

<b>: Re: Give peas a chance!</b> <b>: fluffyporcupine August 12, 2007, 02:10:05 PM</b>
<p>are you collecting them for dinner? ;D</p>
<b>: Re: Give peas a chance!</b> <b>: Alice August 12, 2007, 02:11:39 PM</b>
<p>That's TERRIBLE, Hanny. Are you going to put it in the Astronomically Awful Jokes thread as well? Or would that make it appear to be vegetating? ;)</p> <p>If it gets away, it's an escapee.</p>
<b>: Re: Give peas a chance!</b> <b>: fluffyporcupine August 12, 2007, 02:15:19 PM</b>
<p>peas stop alice! ;)</p>
<b>: Re: Give peas a chance!</b> <b>: Hanny August 12, 2007, 02:16:56 PM</b>
<p>hahaha, yeah it is :)</p> <p>I'm really having a good time here ;D</p> <p>I'll post it in the "awful jokes"-topic and then back to classifying :)</p>

**Figure 2.3**

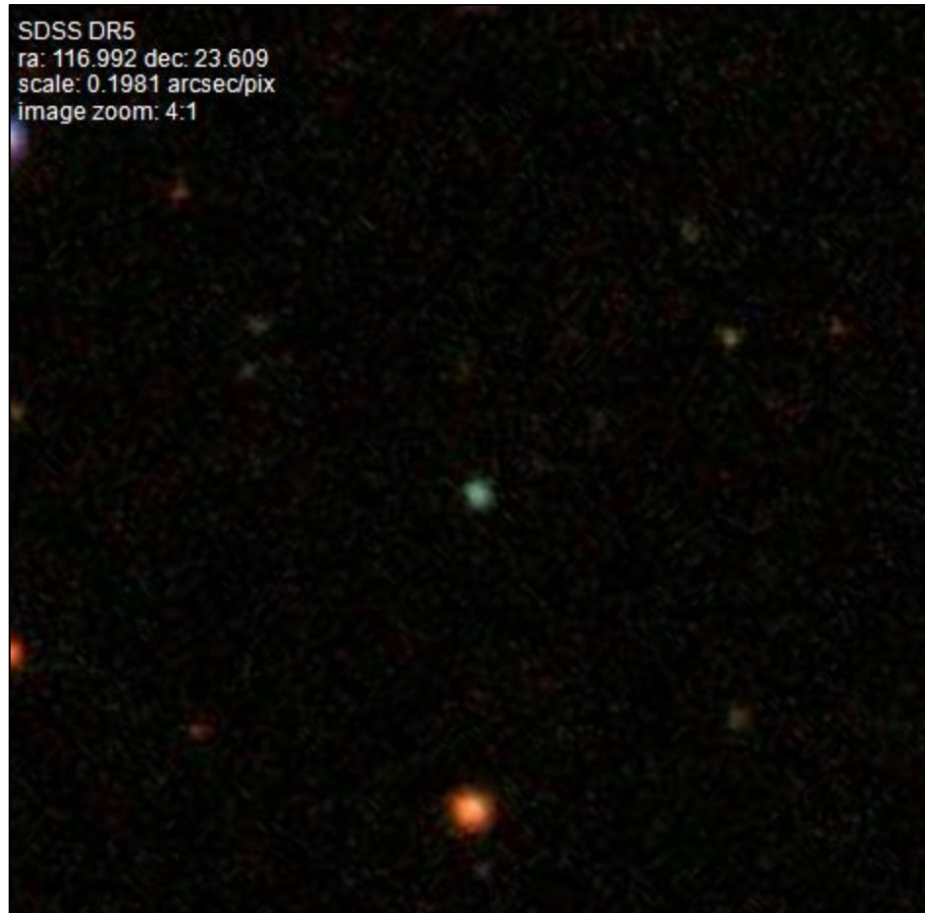
While not the focus of this dissertation, something could be said about the use of humor to break the monotony of classification. This discovery was not yet classified, and the participants likely could not yet fathom its momentous nature. As the thread continued in the month of August, other participants not only posted jokes and other humorous affectations but also started posting their own findings in reply to the initial post. Sometimes participants offered both affectations and new findings in the same post.

One participant immediately after the initial posting located another such galaxy (see Figure 2.4 and 2.5).

**Re: Give peas a chance!**  
**alhart August 12, 2007, 02:59:35 PM**

Here is another pee for you!  
<http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587732152555864324>

**Figure 2.4**



**Figure 2.5**

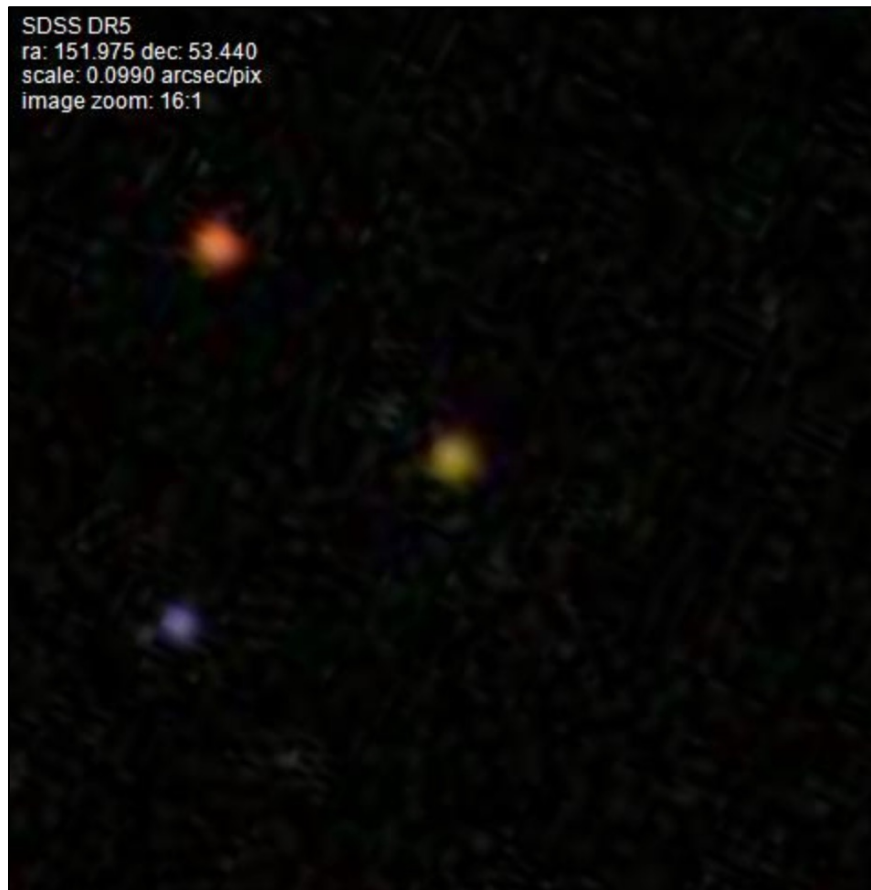
The discovery of other examples of the GPG quickly expanded as participants began looking for examples among the Sloan Digital Sky Survey data. As more and more users began looking for galaxies in green pea form, longer and more involved posts began appearing in the discussion thread. There was even one posting in which the user suggested that the color of the galaxy was not the



same hue of green as other examples found, but, instead, the color of the pea galaxy was a mushy pea in appearance (See Figure 2.6 and 2.7).

<b>Re: Give peas a chance!</b> <b>fluffyporcupine August 12, 2007, 03:17:18 PM</b>
judging by teh colour, this one should be of the mushy type ( <a href="http://skyservice.pha.jhu.edu/dr6/ImgCutout/getjpeg.aspx?ra=151.9751611160510000000&amp;dec=53.44040795538840200000&amp;scale=0.0367797714359355424528301886&amp;opt=&amp;width=424&amp;height=423&amp;version=2">http://skyservice.pha.jhu.edu/dr6/ImgCutout/getjpeg.aspx? ra=151.9751611160510000000&amp;dec=53.44040795538840200000&amp;scale=0.0367797714359355424528301886&amp;opt=&amp;width=424&amp;height=423&amp;version=2</a> ) 587731500795625686 ( <a href="http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587731500795625686">http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587731500795625686</a> )

**Figure 2.6**



**Figure 2.7**

The pea galaxy in Figure 2.7 has more of a yellow-green hue rather than earlier examples of bright green. For this reason, the participant mused that this must be a mushy green pea galaxy. Whether the participants realized, they were classifying the phenomenon through their own personal experience and not

through any existing scientific classification system, though, eventually, these classification systems coexisted within participants' post simultaneously reference personal experience and scientific classification. This dual classification system is one I explore in my Chapter 4 and Chapter 5 analysis.

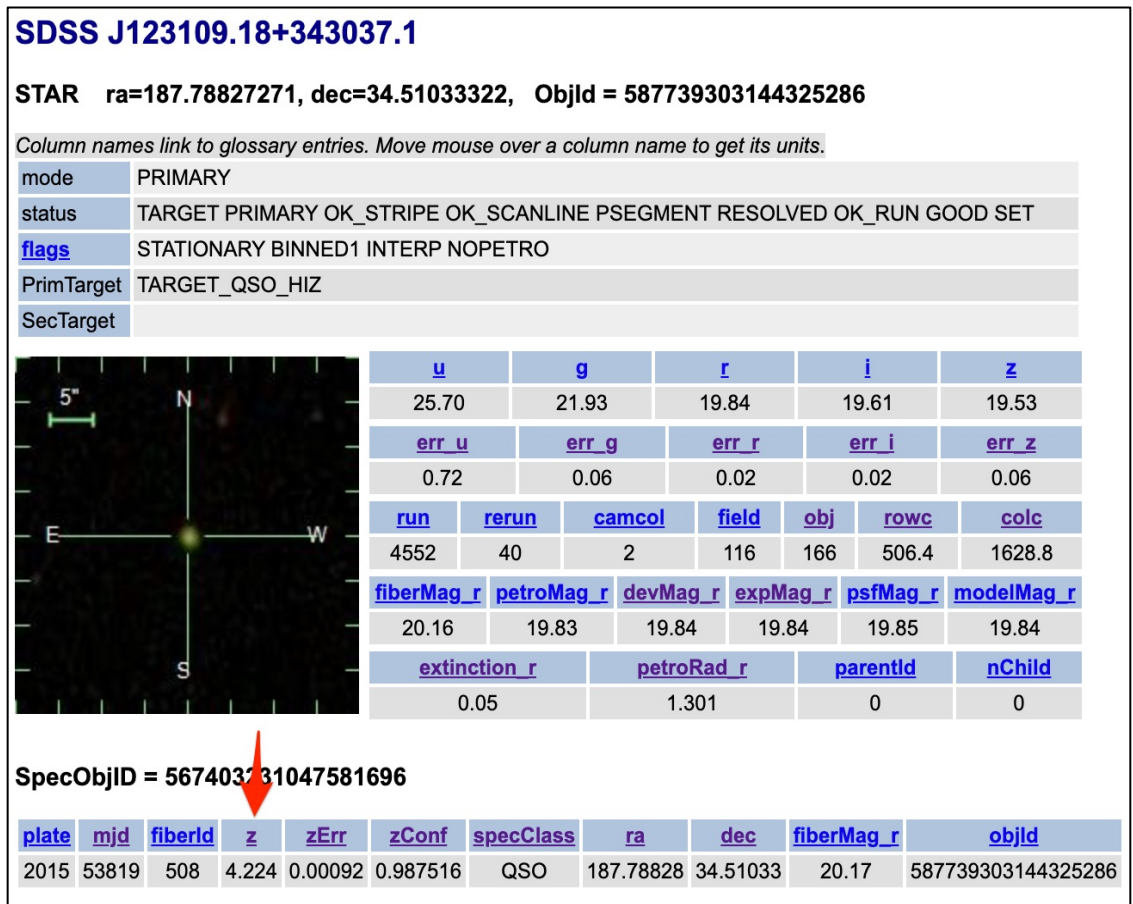
The beginning of scientific classification in the forum refers to the Z-value of a galaxy. The Z-value of a galaxy is the rate at which it is moving away from Earth relative to the speed of light (“Redshifts”). The exact nature of the Z-value and its role in scientific inquiry is not necessary to the goal of this dissertation; however, the use of a value to justify knowledge and discovery within the forum thread, that is in authority-building, is part of the scope of this dissertation. The participants begin to qualify their discoveries in relation to the Z-value of their posts about pea galaxies (see Figure 2.8 and 2.9).

<b>Pea</b> <b>elizabeth August 15, 2007, 05:50:02 PM</b>
<a href="http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587739303144325286">http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587739303144325286</a> ( <a href="http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587739303144325286">http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587739303144325286</a> ) I forgot where the pea thread is.
<b>Re: Pea</b> <b>doomrevival August 15, 2007, 05:53:27 PM</b>
i love space peas...
<b>Re: Pea</b> <b>speedymarie August 15, 2007, 05:54:14 PM</b>
Wow, the Z is over 4.2! That's one of the biggest I've seen.
<b>Re: Pea</b> <b>serpens August 15, 2007, 05:56:36 PM</b>
Yes, and it even has a large confidence value... so here's our new record. Congratulations.

**Figure 2.8**

The values for various categories are made available by the Sloan Digital Sky Survey data package. These values often require some scientific knowledge to interpret, or, at least, these values require a willingness by the participants to investigate scientific thinking and interpretation. The Z-value is simple enough to

understand that it is often the referenced value in discoveries of galactic phenomena within the forum thread.



**Figure 2.9**

In the process of locating new examples of pea galaxies, participants continued the musing along with scientific classification. Participants began posting links to differently formed pea galaxies, ones that do not necessarily align with the initial post; however, the theme of adding another pea to a pot of soup continued (see Figure 2.10 and 2.11).

<b>Re: Give peas a chance!</b> <b>bluefar August 17, 2007, 05:45:25 AM</b>
Another pea 587738947220144406 <a href="http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587738947220144406">http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587738947220144406</a> z=0.413, but quite a big error, confidence=0.735529 ( <a href="http://casjobs.sdss.org/ImgCutoutDR6/getjpeg.aspx?ra=183.47385895&amp;dec=39.78427777&amp;scale=0.049515&amp;width=512&amp;height=512&amp;opt=&amp;query=">http://casjobs.sdss.org/ImgCutoutDR6/getjpeg.aspx?ra=183.47385895&amp;dec=39.78427777&amp;scale=0.049515&amp;width=512&amp;height=512&amp;opt=&amp;query=</a> )
<b>Re: Give peas a chance!</b> <b>elizabeth August 17, 2007, 05:57:23 AM</b>
:o :o Oh thank you for adding another pea to the pot.
<b>Re: Give peas a chance!</b> <b>mitch.wheat August 17, 2007, 08:26:53 AM</b>
Oh, pea-have!

**Figure 2.10**



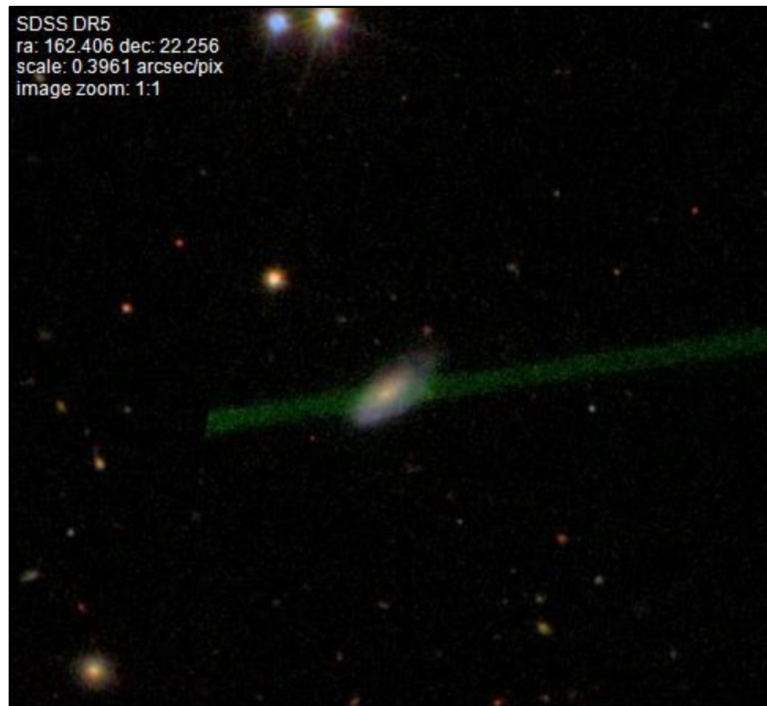
**Figure 2.11**

The pea galaxy in Figure 2.11 resembles the previously mentioned mushy pea with yellow-green hued coloring. As further classification was happening within the forum thread, participants continued to look for similar pea galaxies and found several more before the end of the first seven-day period. Toward the end

of the first seven-day period additional unusual examples began appearing in the discussion thread, and participants provided further musings on the galactic phenomenon (see Figure 2.12 and 2.13).

<b>Re: Give peas a chance!</b> <b>driller August 17, 2007, 04:46:11 PM</b>
( <a href="http://skyservice.pha.jhu.edu/dr6/ImgCutout/getjpeg.aspx?ra=162.40620512422299000000&amp;dec=22.25595035584759900000&amp;scale=0.2611095950288592688679245279&amp;opt=&amp;width=424&amp;height=423&amp;version=2">http://skyservice.pha.jhu.edu/dr6/ImgCutout/getjpeg.aspx? ra=162.40620512422299000000&amp;dec=22.25595035584759900000&amp;scale=0.2611095950288592688679245279&amp;opt=&amp;width=424&amp;height=423&amp;version=2</a> )  <a href="http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587741828045406329">http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587741828045406329</a>  Not so much the milky way - more the Pea Soup way.....
<b>Re: Give peas a chance!</b> <b>Alice August 17, 2007, 04:49:17 PM</b>
Yay! A French bean! ;D

**Figure 2.12**



**Figure 2.13**

Following the green bean style pea galaxy, the first week was finished with a distinctive and brightly colored pea galaxy image (See Figure 2.14 and 2.15).

<p><b>: Re: Give peas a chance!</b>  <b>: mitch.wheat August 18, 2007, 06:22:56 AM</b></p> <p>Fluro Peal In Da House!</p> <p><a href="http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587738409784311877">http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587738409784311877</a></p> <p>(<a href="http://skyservice.pha.jhu.edu/dr6/ImgCutout/getjpeg.aspx?ra=140.5961418279700000000&amp;dec=10.33095564296800000000&amp;scale=0.0723537521542243231132075471&amp;opt=&amp;width=424&amp;height=423&amp;version=2">http://skyservice.pha.jhu.edu/dr6/ImgCutout/getjpeg.aspx?ra=140.5961418279700000000&amp;dec=10.33095564296800000000&amp;scale=0.0723537521542243231132075471&amp;opt=&amp;width=424&amp;height=423&amp;version=2</a>)</p>
<p><b>: Re: Give peas a chance!</b>  <b>: ALKA August 18, 2007, 06:54:09 AM</b></p> <p>(<a href="http://skyservice.pha.jhu.edu/dr6/ImgCutout/getjpeg.aspx?ra=160.3611045070210000000&amp;dec=53.13329037814590100000&amp;scale=0.025808164533579125000000000&amp;opt=&amp;width=424&amp;height=423&amp;version=2">http://skyservice.pha.jhu.edu/dr6/ImgCutout/getjpeg.aspx?ra=160.3611045070210000000&amp;dec=53.13329037814590100000&amp;scale=0.025808164533579125000000000&amp;opt=&amp;width=424&amp;height=423&amp;version=2</a>)  hanny you must be getting a bowl full of peas by now here is another one  <a href="http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587731870165893326">http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587731870165893326</a></p>
<p><b>: Re: Give peas a chance!</b>  <b>: Hanny August 18, 2007, 04:25:44 PM</b></p> <p>Hahaha, thanks guys for all the peas and nice messages ;)</p>
<p><b>: Re: Give peas a chance!</b>  <b>: cpt.Bear August 18, 2007, 07:42:57 PM</b></p> <p>Yay! I got one!  More pea soup please!  z= 3.783  zConf= 0.95  Galaxy Ref: 587725471199986131  (<a href="http://casjobs.sdss.org/ImgCutoutDR6/getjpeg.aspx?ra=116.68560067&amp;dec=39.96382083&amp;scale=0.09903&amp;width=400&amp;height=400&amp;opt=&amp;query=">http://casjobs.sdss.org/ImgCutoutDR6/getjpeg.aspx?ra=116.68560067&amp;dec=39.96382083&amp;scale=0.09903&amp;width=400&amp;height=400&amp;opt=&amp;query=</a>)</p>

**Figure 2.14**



**Figure 2.15**

The discovery of the GPG enabled numerous posts in the first week following the initial post. This was only the beginning of the discovery, as over several years, participants posted more representative examples of the GPG.

The participants engaged with the discovery within a dynamic and playful forum thread. The use of both personal classification and scientific classification created a fascinating opportunity to explore the rhetorical moves and motives that internet users employ to build authority and expertise through tacit argument and knowledge practices. These are themes I explore further in my Chapter 4 analysis and Chapter 5 conclusion.

The discovery of the galaxy led to hundreds of publications and reviews and has directly led to this dissertation. The case of the discovery of the GPG provides an opportunity to explore a classic discussion forum system while considering how nonexperts and lay researchers interact with expert knowledge (in this case, scientific) and self-expertise. The forum thread was open for seven years and still exists in archived form on the Zooniverse platform, where it remains a testament to the ability of crowdsourced knowledge to affect legitimate additions to existing scientific knowledge.

The discovery of the galaxy proves the effectiveness and storied nature of volunteers working to locate new phenomena. Akin to earlier discoveries by scientists and before the advent of digital technologies, the forum thread participants articulated themselves as explorers in random and vast data. They worked on the Galaxy Zoo project not with a focus on discovery but rather a focus on classifying already existing galactic phenomena. To discover a new phenomenon as a nonexpert and lay researcher highlights the telling and enigmatic details of a project wherein nonexperts build expertise among themselves rather than having expertise thrust upon them through traditional

education and learning. The assertions and data provided by the lay researchers within the forum remains a testament to the importance of citizen-science and crowdsourced knowledge practices. As previously discussed, the Zooniverse platform news includes over 100 active projects with thousands of volunteers classifying existing phenomena and hunting for as yet undiscovered knowledge. Participants from around the globe have become the experts of their own narratives using previously cloistered data to craft arguments around their contributions using the type of evidentiary practices that were once the domain of trained scientists and academicians.

### ***Chapter Summary***

In this chapter, I have articulated the background and data sources that led to the discovery of the Green Pea Galaxy. Specifically, I have offered an examination of the underlying processes and the process through which the discovery occurred followed by the first week of back-and-forth discussion around the discovery. This case narrative and background offers a detailed story about how this discovery by nonexpert scientists within a discussion forum on the Zooniverse platform formed the basis for numerous publications and continues to serve as a focus of academic work, including as the exigency of this dissertation.



### **Chapter 3: Understanding Authority Through Rhetorical Analysis**

In this chapter, I discuss the methods I employed to collect and code the data from my research site: the Zooniverse website. Since my focus is on one specific discussion forum bound by time and dedicated to one topic—the discovery of the Green Pea Galaxy (GPG)—I decided to use case study as my method. Given the circumstances of this research project, case study is the appropriate method to fully and accurately collect the discussion forum data. My coding schema employs a first cycle, second cycle, and rhetorical analysis is my method of analysis. This is a case study of the rhetorical moves and motives used by forum participants in their discovery of the GPG in an open and public online environment.

In order to complete this study, it is critical for me to define the study and articulate why it matters to rhetoric, scientific, and technical communication (RSTC). I am guided by the following broad question, which includes two relevant and refined questions:

1. How do nonexperts create expertise?
  - a. How does the discovery of the Green Pea Galaxy through an online discussion forum demonstrate the rhetorical import of contemporary crowdsourced knowledge projects?
  - b. How is authority established and maintained by participants in the discussion forum?

My question to the creation of expertise in crowdsourced knowledge projects establishes a firm foundation on which to build my case study. The two narrowed

questions allow the proper nuance to best explore the data within my research site.

### **Case Study**

Case studies are an approach that investigate circumstances typically bound by time, space, or event and through which bound data is collected. Such studies provide researchers the opportunity to examine a snapshot or instance of data in detail. Case studies are used extensively in RSTC because, in the field, cases can provide examples of phenomena that extend beyond the particular moment. For example, Laura Gurak's book *Persuasion and Privacy in Cyberspace: The Online Protests Over Lotus Marketplace and the Clipper Chip*, notable as the first study of organized online-based protest, used a case study methodology. Other scholars in RSTC who have used case study, include Kristin Pickering ("Emotion, Social Action, and Agency: A Case Study of an Intercultural, Technical Communication Intern"); Scott Graham and Brandon Whalen ("Mode, Medium, and Genre: A Case Study of Decisions in New-Media Design"); and Laurie Gries (*Still Life With Rhetoric: A New Materialist Approach for Visual Rhetorics*). In this section, I will discuss the nature of case study as a methodology, and its advantages and disadvantages.

### **The Nature of Case Study**

A case study is most readily defined in two parts. Robert Yin, the foremost authority on case study methodology, breaks the definition of case study into "the scope of a case study" and "the features of a case study": First, "a case study is an empirical inquiry that investigates a contemporary phenomenon (the 'case') in

depth and within its real-world context, especially when the boundaries between phenomenon and context may not be clearly evident” (16). The key element of the first part of this definition is the focus on real-world context. Case study is inherently about studying how artifacts occur organically outside of controlled circumstances.

Second, “a case study inquiry copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as one result, relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result, benefits from the prior development of theoretical propositions to guide data collection and analysis” (17). The key element of the second part of this definition is the focus on variables of interest. It is possible—and even likely—that there will be more trajectories for research that pull the researcher’s interest away from the central focus of the case study. This should be expected and addressed in analysis and discussion; however, those trajectories, while potential points of expanded research, should not distract from the previously articulated theoretical approach or research questions. Importantly, case study examines *singular* events in time, space, and place.

An excellent contemporary example of a case study is the first use of the phrase “fake news” by then-candidate Donald Trump during the 2016 Election Cycle and ending on Election Day. This case is bound by specific circumstances; that is, the election cycle ending on the 2016 Election Day and the use of one specific phrase within that cycle, “fake news.” Case study is the methodology that

provides for the collection, analysis, and reporting of data focused on the 2016 Election Cycle. Case study methodology not only tells the researcher how to approach data but, also, how not to approach data. To better understand the parameters of case study, I consult three noted researchers: Robert Yin, Robert Stake, and David Gray.

I have already introduced Yin's definition of case study. Yin further notes that case study methodology is used in various fields, providing researchers an opportunity to examine dynamic situations. Notably, these situations "contribute to our knowledge of individual, group, organizational, social, political, and related phenomena" (4). Case study methodology is appropriate in those situations bound by time, space, and place. Moreover, as different situations call for different methods, Yin suggests that a case study is more concerned with the how and why of contemporary events rather than the who, what, or where (9). While Yin's articulation of case study methodology is seminal, it offers a highly prescriptive and narrower model of approaching a case.

In fact, a case study need not be focused simply on the how and the why of a contemporary event. Indeed, for the purposes of rhetoric and computer-mediated communication, the who is infinitely important, perhaps even more so than the how and why, because it is the who that provides a reason for the how and why. Robert Stake provides a more descriptive and holistic model for approaching a case. Stake's understanding of case study is more nebulous, with more attention paid to how to conduct a case study rather than the minutiae of each attribute. For Stake, a case is "a specific, a complex, functioning thing" that

is bound by time or place. Stake is concerned with case study “as an object rather than a process” (*Case Study Research 2*), and the goal of a case study is to “learn about that particular case” (*Case Study Research 3*). Case study is about specificity. A researcher chooses a specific case, a specific approach, and a specific framework.

Gray mostly adheres to the definition Yin works under; however, Gray further clarifies some aspects of case study, proposing that, “[c]ase studies...explore subjects and issues where relationships may be ambiguous or uncertain” (123). This is particularly important because Gray focuses case study on the relationship between points of information within a case, while still holding to the holistic approach advocated by Stake and the understanding offered by Yin. A case study should attempt to view an event from observational distance in order to ascertain the interplay between information within the case and information encountering the case from outside of it.

### ***Case Study Advantages and Disadvantages***

Yin explains some of the issues with case study methodology and the disdain some researchers have for the methodology. Yin states that “as a research endeavor, the case study has been viewed as a less desirable form of inquiry than either an experiment or a survey” (19)<sup>4</sup>. But, if case study is less desirable, as Yin suggests, why would any researcher want to engage it as a methodology? As with all research methods, there are advantages and disadvantages to case study methodology. For digital rhetoric, computer-

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<sup>4</sup> In this case, Robert Yin is mainly writing for and speaking to social scientists (e.g. psychologists, political scientists, etc.) who favor more empirical and quantitative work.

mediated communication, and internet research, the advantages of case study outweigh the disadvantages, providing a useful and clear method for collecting, analyzing, and reporting data.

### ***Advantages***

A critical advantage of case study methodology is that it allows the researcher “to focus on a ‘case’ and retain a holistic and real-world perspective...” (Yin 4). The focus on a holistic examination of data is a hallmark of case studies. Stake makes note of this advantage and suggests that case study methodology provides the researcher the opportunity to investigate the intricacies and attributes of a case by approaching it holistically (*Case Study Research* 2-4). Moreover, case study methodology can offer understanding and experience of a case that might not otherwise be available. The intense focus on “interest in individual cases” and not so much “the methods of inquiry used” offers a type of clarity into the phenomena inherent within a case (Stake, “Case Studies” 134). This clarity and holistic collection and analysis of data proves beneficial to the researcher and those within the case because, as Mary Sue MacNealy suggests, it can “lead to a better understanding of an event or situation” (199).

These advantages offer the researcher space to identify attributes of a case and support to employ the appropriate analytical approach. The breadth of data available ensures that the researcher can ascertain a broad understanding of the driving forces and outcomes of a case. Ensuring the holistic and real-world nature of a case is essential and imperative to any researcher engaged in

internet-based research. As the internet is vast and teeming with available data, it becomes necessary to select a moment, event, or artifact—that is, a case—on which to focus and consider the participants as in that moment, event, or artifact as living interactive entities.

### ***Disadvantages***

There are disadvantages to case study methodology. As Yin noted, case studies tend to be less respected than other methodologies in highly quantitative fields. There are normally concerns with generalizability, and “that it is often difficult (indeed, dangerous) to generalize from a specific case” (Gray 125). While this criticism is valid, generalization is often accounted for and avoided (as best as possible) during the research design process. Any generalization that might occur happens during analysis and discussion, where it is likely more appropriate. Another disadvantage of case studies are the “amount of time they take and the volume of documentation they generate” (Gray 125). The act of spending significant time collecting any and all data available may appear haphazard, but case study “often [is] a demanding and difficult approach” because there is little standardization in such a method (Gray 124).

Yet, despite these disadvantages, case studies in RSTC have several strengths, as described in my next section. These strengths are particularly helpful in examining internet-based phenomena, and case studies provide opportunities to researchers willing to examine data within specific circumstances. A case study approach is relevant to my research focus, as I further articulate in the next section.

### ***Case Study of the Green Pea Galaxy.***

For the Green Pea Galaxy, a case study approach provides a clear way to collect, analyze, and report discussion forum data. In particular, a case study approach is suitable because the GPG discovery is an event bounded by time, has distinct phases (beginning, middle, end), and requires careful analysis of not only the language used but also the entire situation and context (that is, the case). For my research, I am looking at one specific event as told through one specific discussion forum on the Zooniverse website. The discussion forum contains interactions between participants over a several year period resulting in more than 2000 discussion forum posts. However, despite the number of posts, the study examines the singular event of the discovery. The data is collected systematically to preserve the intimacy and real-world context of the interactions that resulted in the discovery. This data is bound by space (online) and time (several years). Therefore, it is appropriate for a case study approach.

### ***Rhetorical Analysis***

Case study is an approach for collecting and forming data; it is not an analytical approach, so it was necessary to select an appropriate and, importantly, broad enough analytical approach to best capture the breadth of interaction and discussion within my data. As previously noted, the case study approach can involve a variety of analytical methods. For this case, rhetorical analysis is my choice, and, in some ways, most rhetorical analyses are inherently case studies because rhetoricians examination particular instances of discourse rather than generalize. I considered other approaches, such as interviews,



discourse analysis, and corpus linguistics, but my research questions directed me toward rhetorical analysis as the most appropriate method of analysis in this case. Since one of my concerns is the persuasive nature of rhetorical motives and moves of discussion forum participants, it is appropriate to use rhetorical analysis as my analytical approach. I adopt Sonja Foss' critical definition of rhetorical analysis for my work. She describes rhetorical analysis as "...a qualitative research method that is designed for the systematic investigation and explanation of symbolic acts and artifacts for the purpose of understanding rhetorical processes" (6). Foss' definition coupled with Cheryl Geisler's understanding of the rhetorical aspects of expertise and knowledge production (53-66) provides me a solid framework to examine my case.

I am concerned with the rhetorical construction of authority and choices of discussion forum participants, and rhetorical analysis provides me the most room to navigate the dynamic nature of those rhetorical choices. Moreover, rhetorical analysis has been used extensively and successfully in the study of internet-based phenomena (Gurak; Logie; Ridolfo; McNely).

### ***Data Collection***

As illustrated in Chapter 1, the study of online discourse and computer-mediated communication is well-established, including the study of discussion forums and internet-based knowledge projects. Discussion forums and knowledge projects have been researched since the advent of the internet, including analyses of technical systems, situational concerns of mobilizing discourse, and historical issues of distributed networks.

To analyze my data, I focused on the following: First, I defined a set timeframe and online space for my case study; second, I secured and sampled my data by downloading a full copy of it; third, I established and employed cycles of analysis; and lastly, I engaged in rigorous data storage and backup.

### ***Time Frame***

The discussion forum for the GPG began in 2007 and closed in 2014. There are over 2000 posts within the discussion forum, and, therefore, it was necessary to review every discussion post and narrow the collection to specific time periods within the overall case. Early in reviewing the discussion forum, I determined that a specific time period following the initial post and a specific time period up until the establishment of certain criteria within the discussion forum would be suitable for analysis. This shrunk the number of discussion posts from over 2000 to 640. This slice of time is critical within the discussion forum and my research because, since my focus is on authority and expertise, the discussion forum begins with no criteria for evaluating the GPG discovery and then, at discussion post 640, criteria are established by which the galaxy is evaluated. This time period is essential to understanding the nuances in establishing authoritative rhetorical moves by nonexperts. As I reviewed the data, I needed to expand beyond the initial time periods within the case; however, this expansion was small and did not considerably expand the original time period selections. I have sampled my data from these time periods for my coding and analysis.

## **Archives**

The entire discussion forum<sup>5</sup> is publicly archived and accessible on the Zooniverse website, specifically the Galaxy Zoo Forum. Every post within the discussion forum is dated and provides information on the posting forum participant. The discussion forum is currently closed, so no other posts can be made, providing a static data set for analysis. I have also downloaded the entire discussion forum to ensure the stability of the data in case the website should be corrupted or removed.

## **Cycles of Analysis**

For my analysis, I adopted the coding and analysis cycles advocated and articulated in Johnny Saldana's 2016 text, *The Coding Manual for Qualitative Researchers*. Saldana sees coding and analysis as cycles that require continuous feedback loops to ensure that the nuances of data are captured and highlighted. Saldana's goal is to provide researchers the tools to ensure that nothing is missed and all attributes of data are defined. While tending to use "analysis" loosely, Saldana understands coding as inextricably connected to the chosen analysis: in my case, rhetorical analysis. Saldana's manual provides the avenues for developing codes that best fit with the chosen analytic approach. The importance of Saldana's manual is in the cyclical approach to coding and analysis, which can assist a researcher in better understanding data. I adopt not only Saldana's cyclical approach but also some of the terminology used (e.g., Cycle 1 instead of Stage 1).

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<sup>5</sup> The discussion forum is currently accessible here: <http://www.galaxyzooforum.org/index.php?topic=3638.0>.

### ***Cycle 1 Coding***

For my first coding cycle, I will employ In Vivo Coding. Saldana has written extensively on In Vivo Coding, and he articulates this type of coding to be one in which “a code refers to a word or short phrase from the actual language found in the qualitative data record” (105). That is, I will code the data using the language found in the discussions and interactions of participants within my case study. In Vivo Coding considers participants to be part of a specific community and, therefore, will use specific language in discussions and interactions. Saldana suggests that In Vivo Coding is often used where “participant-generated” language is crucial to understanding the goal of said language and in understanding the perspective of participants within their community (105-106). Since my data is bound within a specific community, In Vivo Coding will allow me to examine the participants' discussions and interactions through their own words, which will allow me a better opportunity to capture the intention of those discussions and interactions.

### ***Cycle 2 Coding***

For my second coding cycle, I will employ (modified) Elaborative Coding. Saldana articulates this type of coding as “top-down” that allows theoretical constructs to emerge from the data (255). I have identified my Elaborative Coding as modified because in traditional Elaborative Coding, the researcher is attempting to confirm an existing study with new evidence. I am not doing so. Instead, I am adopting Elaborative Coding as a way to look holistically at my coded data to see what categories emerge that can answer my research

question. Furthermore, in Elaborative Coding, I will bring my own theoretical constructs to the coded data to determine what else can be learned from it. While my Cycle 1 coding—In Vivo Coding—is a bottom-up approach to reviewing and identifying data, Elaborative Coding is more concerned with the top-down and overview of the data. In this way, I will examine my data from two different perspectives in order to best understand the data.

### ***Relevant Software***

There are many ways in which to code qualitative data. Data can be coded by hand, using computer software (e.g., Excel), or through specialized computer software designed for qualitative analysis. For my coding, I am using qualitative analysis software called NVivo 12. I am using this software because it allows me to code through my computer, helps organize my coding schema, and provides an interface through which I can better determine the aspects of my data. The main benefit to using the software is in allowing me a space in which all of my notes, codes, and thoughts can be coalesced and reviewed before I begin my analysis and discussion of my data and findings.

### ***Data Storage***

The most expedient way to ensure access to the data in perpetuity was by downloading the entire discussion forum and storing it both in the cloud (Dropbox), on an external hard drive, and on the computer on which the research was written. In addition, the data was regularly backed-up through an automatic cloud-based update system: Backblaze. All storage was encrypted and password-protected.

The data storage ensures that access will always be available; furthermore, the data is also accessible on the main Zooniverse website on servers housed at the University of Minnesota. It is unlikely that the Zooniverse website, given its importance to citizen-science and scientific communication, will ever not be accessible. In this way, the data is stored publicly online for any person to access at any time.

### ***Chapter Summary***

In this chapter, I have outlined my research site and method for data collection and analysis. Specifically, I have detailed the affordances and constraints of using case study methodology and the reasons why my selection of case study is appropriate for my work. I have discussed the relevance of rhetorical analysis as my method for examining my data and the ways rhetorical analysis is the best approach for my data. Furthermore, I have provided for data collection and storage and other steps I have taken to ensure the reliability and stability of my data during and beyond my project.

## **Chapter 4: Exploring the Construction of Authority**

As I outlined in Chapter 3, the concept of authority (ethos) is critical to understanding how people interact in online spaces. The term and idea has a long and varied history, though the most notable would be Aristotle's understanding of authority as one of the three appeals. How and in what ways people are allowed to use their authority or have the ability to speak on a subject in a way that others will trust is at the root of communication. For Aristotle, authority is about building a rapport with one's audience that is based in cultural heritage and shared experience in order to establish a relationship of trust, and, as discussed in my previous chapter, the features of ethos that lead to said trust have not dramatically changed since his time.

In my analysis of forum discussions, the concept of authority is developed through the search for and codification of characteristics and criteria. The use of references, replies, and rhetorical moves coalesce to build the authority of forum participants in relation to the discovery of an unknown object. Through building authority, participants establish themselves as competent lay researchers and develop a type of localized expertise that exists only in the online space of Zooniverse. While all expertise is essentially contextual, the type of expertise these participants develop arises organically rather than through traditional learning. Certain habits and perspectives develop that might otherwise be avoided.

In this chapter, I analyze the forum discussions of the Green Pea Galaxy (GPG) discovery through the lens of authority-building by and between

participants. This focus on authority provides an opportunity to better understand how individuals create and maintain communication through knowledge practices. In this chapter, my focus on an online space offers a potential background for further understanding of how internet users in general build authority between each other and trust the information they have received.

### ***Building Authority Within a System***

As previously mentioned, Aristotle understood authority as building a relationship with one's audience through which trust is created and maintained. In classical and modern rhetoric, a rhetor takes up the concern of building a relationship with their audience because they understand the significance of such an endeavor. In order for a message to be truly successful, the audience receiving said message must believe that a rhetor is qualified to articulate it. In standard rhetorical structures, there is a consciousness at work in considering authority and the trustworthiness of a message; however, everyday internet users seldom consider the way they construct their message because the system in which their message is propagated is afforded and constrained by the parameters of the system itself. Internet users may have little control over how their message appears and in what ways it spreads.

The system in which a message appears affords and constrains the contours and parameters of a message and how and in what ways that message can be trusted. While a rhetor can never fully control the system in which a message appears, it becomes a delicate dance between the actual and ideal audiences. In my examination of Zooniverse forum data, it became apparent that



the parameters of the Zooniverse system played a critical role in the development of authority among its participants.

As noted in Chapter 3, I coded my data through an inductive process, so I could better understand the categories and classifications that arose out of the data. Through that coding, I formulated three distinct categories in which messages appeared in the Zooniverse forum: reference practices, reply style, and rhetorical moves. I explore each of these categories through rhetorical analysis and provide specific examples in the following sections of this chapter.

### ***A Brief Discussion of (Digital) Space***

Before I turn to the rhetorical analysis of my three categories, I would first like to discuss the idea of digital space. Regardless of what those categories contain, they all exist within a system and space governed by affordances and constraints. As evidenced in Chapter 1, there has been much discussion of digital space and on the differences between the analog and the digital. The purpose of the cursory discussion that follows is only to show that the existence of the space is as essential to authority as the concept of authority itself.

A lot can be said about the internet, and a lot has been said about it. As mentioned previously in Chapter 3, the computer system Zooniverse uses to bring together participants is not new nor astounding. It is a classic bulletin-board system based on posting a topic and then replying to that topic, leading to the creation of threads. There is an enormous amount of back-and-forth within these threads that form the basis for discussions. This bulletin-board system is still replicated in many contemporary discussion venues. For example: Reddit,

Twitter, and Facebook all use similar style computer systems to encourage interaction among their users. What makes Zooniverse's use of such a system important is in its purpose: the discovery of knowledge.

The goal first and foremost of Zooniverse is to seek out what remains to be discovered among a plethora of data. Most social media and social communication systems and venues cannot suggest the same as their first and foremost goal. It is reasonable to accept that those systems do produce knowledge at some level and, in classic internet fashion, fuel the speed and reach of said knowledge. But, still, I would not argue that Facebook's first goal is discovery of knowledge but, rather, creation of community. Nor, I would not argue that Twitter creates knowledge but that it only broadcasts information. These types of social sites aim to create sociality but not necessarily discover knowledge.

In considering the digital space, it is critical to know what it is not. Digital space is not always tactile and, in some cases, not always tangible. Digital space exists outside of normal physical interaction. As evidenced in my Chapter 1 literature review, scholars have explored the lack of social and cultural cues within digital spaces for decades. Moreover, these scholars have explored how the lack of social and cultural cues affect the construction of authority. I partly continue this work as these issues are related to my concern in this dissertation.

Digital space is inherently social because it depends on the interaction of users within a system to produce whatever the system is designed to produce. The use of signs and symbols within a space produce the social nature of the

space. The space that Zooniverse created in order to discover knowledge is social. This is, of course, one of the goals of the Zooniverse system. The system gives rise to a space for signs and symbols to be produced and interact, and it is in these signs and symbols that knowledge is a focal point (Lefebvre 73, 132-134).

The entirety of the Zooniverse system, especially when understood as social, exists to identify, categorize, and produce knowledge. The system is a foundation on which authority is established. The space and place are imperative to what follows within the system. Zooniverse as a system pays attention to the detail of space and place. The space and place in which something happens is often as important as what is happening. For instance, Plato begins *The Phaedrus* with an attention to space and place because it is so important to the actions and dialogues of the characters. The space and place of the characters in *The Phaedrus* affords and constrains those characters and further defines the parameters of the dialogue. In this same way, Zooniverse's space and place dictate the interactions that happen within it, and those who participate within it are afforded and constrained by the system designed to discover and classify knowledge.

### ***The Affordances of Zooniverse***

Zooniverse is an incredible system. As I previously mentioned in Chapter 2, Zooniverse is a system allowing scholars and researchers from around the world to store and request categorization help from internet users writ large. In short, Zooniverse provides for thousands of volunteer research assistants to

complete the work that would require a lifetime for a single scientist or scholar. That is the main affordance of Zooniverse: access to volunteers.

The system allows researchers to upload raw data—like digital sky survey data, for example—for free. Researchers can then invite people from around the world to categorize said raw data using a predetermined list of categories. This predetermined list is often provided by the researchers who uploaded the raw data. The system allows not only categorization but also the analysis that comes with that categorization.

### ***The Constraints of Zooniverse***

While Zooniverse is an incredible system, it is also constrained in many ways. These constraints mostly apply to the researchers who upload the raw data, but some do apply to the users invited to categorize the data. The system allows access to volunteers, which is its biggest affordance, but it is also its biggest constraint. As with many things on the internet, there is a level of anonymity inherent in those who contribute to projects. Researchers cannot know for certain who is contributing to a research project but only that someone did contribute to it.

The system will not allow wholesale data download, and there is a question of who controls the data once it is uploaded. These constraints are built into the system, such as constraints are in many systems. However, such constraints might be necessary for the success of Zooniverse as a whole. It would be difficult to have a decentralized system in which data was uploaded and left to roam free.

## ***Constructing Authority***

As previously discussed, authority is a long established but somewhat contentious term. Rhetorically, the term (that is, ethos) has been debated for more than 2000 years and was central to Aristotle's work. In my dissertation, I am concerned with how authority is constructed within a system dependent on expertise and dedicated to the discovery of knowledge. How and in what ways authority and, by extension, expertise are trusted is critical to twenty-first century born-digital communication. Many digital systems are still based primarily in alphanumeric text. The Zooniverse system is both visual and alphanumeric-based, but the discussion forum data—my primary data—is mostly alphanumeric.

As I coded, I examined the discussion forum data, focusing on authority construction. As I coded, the postings I examined coalesced around three broad categories: reference practices, reply style, and rhetorical moves. These are the three main ways in which forum users communicated within the Green Pea Galaxy discussion forum, and they are also the most self-evident categories in the data; however, despite that, they do serve as functional and descriptive categories for breaking down information. Through three rounds of coding, I was able to refine these categories into subcategories that include basic reference and developed reference; emoticon reply and text reply; and declaring and hedging.

Given the magnitude of the discussion posts about the Green Pea Galaxy, I narrowed my timeframe to include the first 640 discussion posts. Out of 640 posts, I coded each with the following result:

CATEGORY	SUBCATEGORY	NUMBER OF CODED POSTS
<b><i>Reference Practices</i></b>		<b>276</b>
	Basic Reference	133
	Developed Reference	143
<b> </b>		
<b><i>Reply Style</i></b>		<b>275</b>
	Emoticon Reply	63
	Text Reply	212
<b> </b>		
<b><i>Rhetorical Moves</i></b>		<b>220</b>
	Declaring	87
	Hedging	87

***Table 4.1***

Some coded posts were later discarded for lack of relevance or reliability.

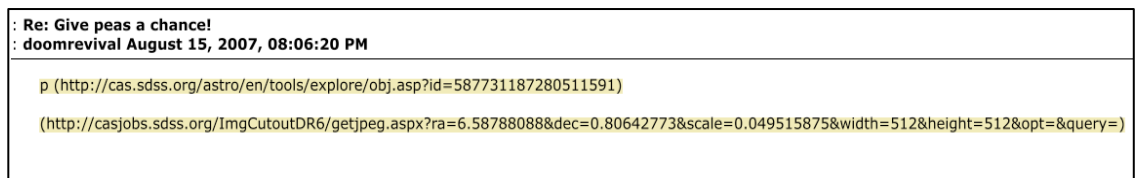
Duplicate postings were also discarded, unless those postings had a particular contextual usage within the forum. Standardized criteria were introduced at posting 640, which is why I stopped coding at that location.

***Reference Practices***

In coding reference practice, I mean, the posting of a link to another example in support of the discovery of the Green Pea Galaxy (GPG). The discussion forum system allowed for the creation of threads and topics, and, in many instances, other users would reply to the initial posting with a link to more Sloan Digital Sky Survey (SDSS) data providing another example of a pea galaxy.

This collection of objects formed the basis on which users could declare the discovery of a new galaxy, and the collection of examples became useful to traditionally-trained researchers in later scientific work. This type of referencing to textual practices as well as links to corresponding visuals forms part of a rhetorical reasoning, and it is a part in which nontraditionally trained researchers (that is, lay researchers) crafted their own rudimentary criteria of their own discovery.

I coded the reference practices as either basic or developed. A basic reference is often only a link. There will be no other referencing material to the actual GPG example. In most cases, the user would need to click on the link to follow through with the discovery example. By clicking on the basic reference, the user is moved to the SDSS website, where the user can access detailed information about the particular example posted in the forum.



**Figure 4.1**

In Figure 4.1, the forum user has posted a simple link to the example. The posting of a basic link is meant to elicit a response from other forum participants, which could be as simple as following the link. In the forum, when a basic link is posted, it is the simplest function a user could complete in order to contribute an example of a GPG. If the link in Figure 4.1 is followed, the user is taken to an SDSS page.

**DR7**  
SDSS

Explore Home

Search by

- ObjId
- Ra,dec
- 5-part SDSS
- Plate-MJD-Fiber
- SpecObjId

Summary

PhotoObj

- PhotoTag
- More Observations
- Field
- Frame
- PhotoZ
- Neighbors
- Finding chart
- Navigate
- FITS

SpecObj

- All Spectra
- SpecLine
- SpecLineIndex
- XCredShift
- ELredShift
- Spectrum
- Plate
- FITS

NED search

SIMBAD search

ADS search

Notes

- Save in Notes
- Show Notes

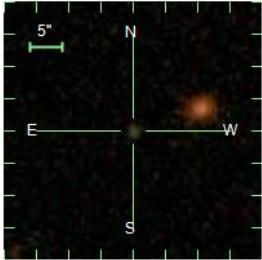
Print

### SDSS J002621.09+004823.1

**GALAXY** ra=6.58788141, dec=0.80642753, ObjId = 587731187280511591

Column names link to glossary entries. Move mouse over a column name to get its units.

mode	PRIMARY				
status	PRIMARY OK_STRIPE OK_SCANLINE PSEGMENT RESOLVED OK_RUN GOOD SET				
flags	PEAKS_TOO_CLOSE STATIONARY NODEBLEND_MOVING MOVED BINNED1 NOPETRO				
PrimTarget					
SecTarget					



u	g	r	i	z		
23.23	22.66	21.34	20.96	21.25		
err_u	err_g	err_r	err_i	err_z		
0.74	0.17	0.08	0.10	0.46		
run	rerun	camcol	field	obj	rowc	colc
2662	40	5	326	615	1310.3	1678.6
fiberMag_r	petroMag_r	devMag_r	expMag_r	psfMag_r	modelMag_r	
21.87	21.49	21.34	21.42	21.67	21.34	
extinction_r	petroRad_r	parentId	nChild			
0.07	1.820	0	0			

**No scienceprimary SpecObj linked to this PhotoObj**  
(Click on "All Spectra" link if you think this object has a spectrum)

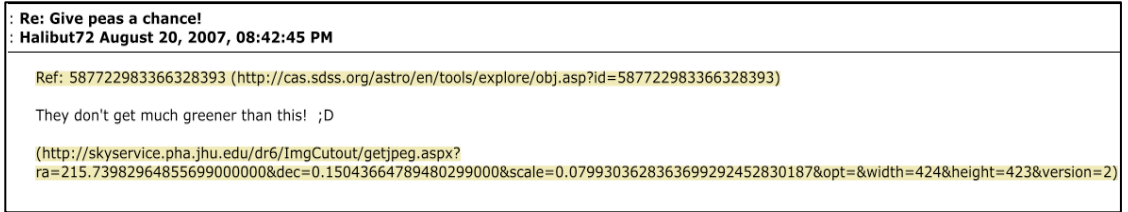
**Cross-identifications**

**Figure 4.2**

The link in Figure 4.1 takes the user to the SDSS page as shown in Figure 4.2. Here, the user posted a link that led to a potential example of a GPG. Forum users articulate the characteristics and parameters of a GPG in later forum posts, which I will explore later in this chapter.

In a developed reference, the user posts a link and, typically, the object code or reference ID of the SDSS object the user believes to be a GPG. The function of the object code or reference ID in the SDSS system allows a user to locate an object within the SDSS data without having a direct link. In posting both a link and an object code, a user provides other forum participants the opportunity to explore further potential examples of GPGs.





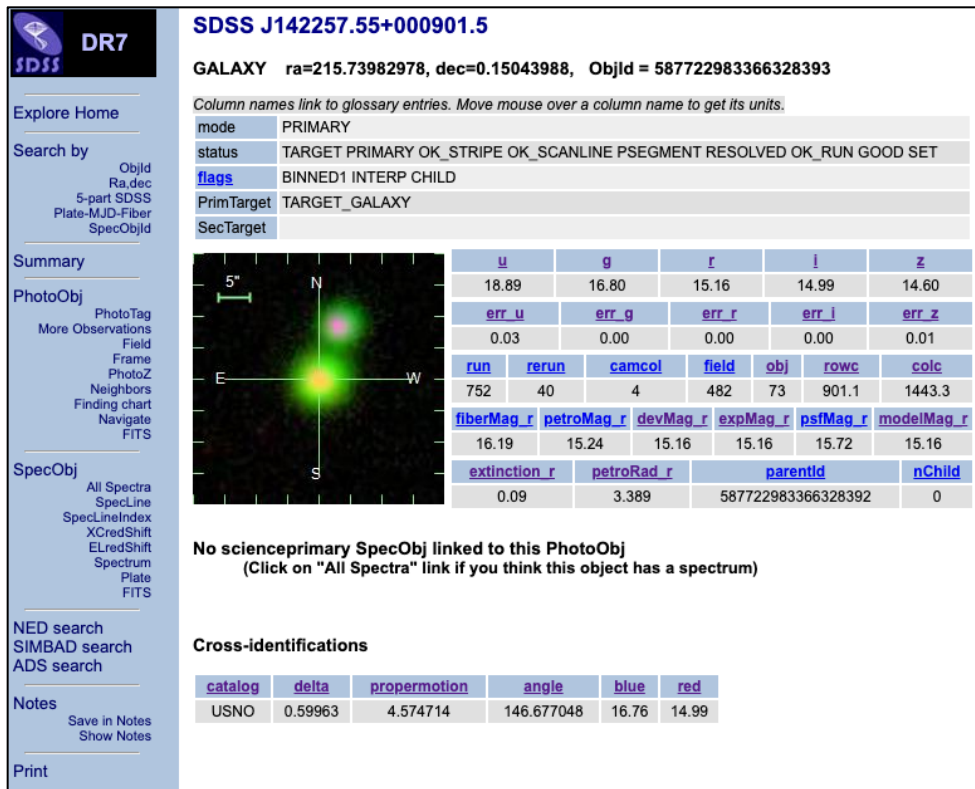
**Figure 4.3**

In Figure 4.3, the user has posted a link to the GPG example as well as the reference ID. The importance of posting both becomes paramount in later discussion interactions because links do not always remain active or may be broken for some reason; however, the object code or reference ID of an object within the SDSS system is static. A user could take the object code or reference ID and use the search function on the SDSS website to locate a GPG example.



**Figure 4.4**

By taking the reference ID (587722983366328393) provided by the user in Figure 4.3 and using the "ObjId" search function (see Figure 4.4), anyone can search for and be sent to the relevant example. This type of developed reference provides an added layer of interaction.



**Figure 4.5**

In Figure 4.5, a brightly colored GPG example is seen. Using the object code or reference ID might also produce other useful information (e.g., cross-identifications). This other useful information feeds into scientific research but is not relevant to my research at this time. The difference in coded categories is relevant, though.

These different categories might seem the same, but they are not. The posting of a basic or developed link is a rhetorical act in the construction of authority. In the forum, the link first represents evidence of something unknown, and, then, the link later represents evidence of something known but still lacking clear classification. The exploratory nature of the evidence encourages users to

follow through and decide for themselves on the claim that a certain image shows a GPG.

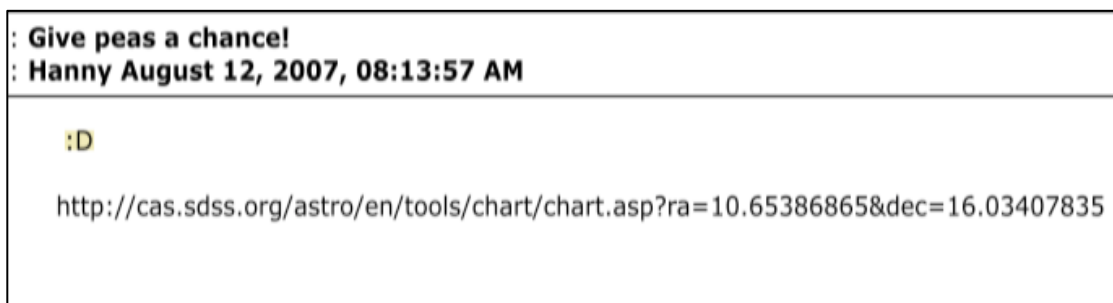
A link is one of the most fundamental artifacts underlying the entire internet infrastructure. The concept and creation of the hyperlink helped create the contemporary World Wide Web (see *Weaving the Web* by Tim Berners-Lee). Through my coding and examination of the links within the forum, I discovered that they are inextricably rhetorical acts because they invite interaction with evidence in a similar way as evidence in a traditional essay or some other written form. Eventually, the amount of evidence becomes so great that the concept of discovery is moot.

When users post basic or developed links to the forum, they are inherently building a collection of examples to be used as evidence in later rhetorical moves. The easiness of linking becomes critical to the type of discovery declared in the forum. As a component for constructing authority, the posting of links to examples found in the SDSS system is important. As I mused earlier in this chapter on digital space, the combination of the SDSS system and the Zooniverse system provides ample authoritative support for the discovery. The digital spaces offer support to the links that exist within those spaces. The amount of linking between the two systems, as should be expected given the nature of the scientific research project, shows that links are not just simple conveyances to other locations on the internet but also rhetorical acts through which evidence is created, contained, and moved in support of a larger purpose or argument.

## **Reply Style**

After examining the reference structures within the forum posts, I moved my focus to the types of replies users posted. Through coding, I developed two subcategories for the types of replies in the forum: emoticon reply and text reply. The Zooniverse system allows for text-based postings with minimal visual postings. Though some users did embed photos of their GPG examples, most of the forum users replied to the initial discovery post with basic or developed links and text-based replies. I developed the above-mentioned reply style categories and, later, further refined those categories into rhetorical moves. However, before I discuss my coding of rhetorical moves, I want first to discuss the reply style categories.

A long-established function of the internet is emoticon communication. I touched briefly on emoticon communication in Chapter 1, even though emoticon communication is not the focus of my research project. I coded emoticon usage in my data because emoticon usage is a form of communication. In some cases, an emoticon reply was the only communication between users.



**Figure 4.6**

In fact, the first posting to the forum—the post that started it all—was an emoticon and basic link to a GPG example (see Figure 4.6). In later forum postings, the

user in Figure 4.6 indicates that the first post in the forum was meant in jest. The use of the open mouth [:D] emoticon seems to provide some sort of playfulness. That emoticon usage along with the title of the forum provided other users an opportunity to use metaphor and euphemism to talk about different types of peas (as in the vegetable).

In many cases, the emoticon replies seemed to be carrying the interpretation of tone and demeanor. Such replies also seem to be working on some level in support of the rhetorical reasoning within the forum. I describe the emoticon replies as mostly playful, and, in examining such usage, I found that emoticon replies could be interpreted as disarming, which is important in a space where tone is difficult to understand. For example, in Figure 4.7, emoticon replies augment significantly the text replies.

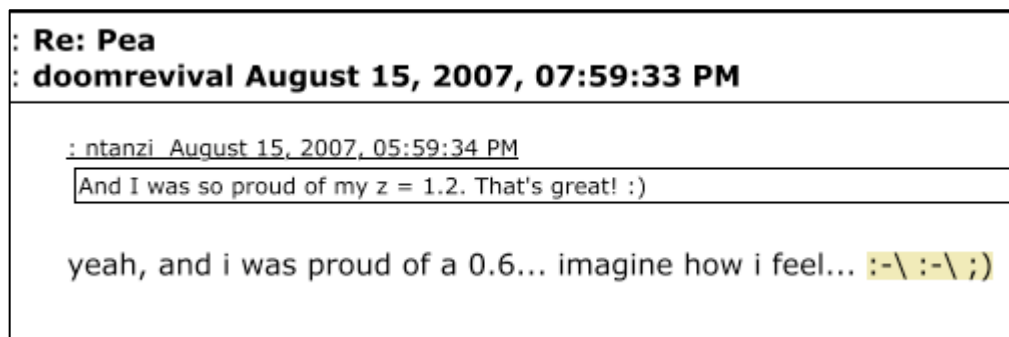
<b>: Re: Give peas a chance!</b> <b>: driller August 12, 2007, 05:00:32 PM</b>
I was wondering if maybe you'd found a pulse-ah! ;) Or maybe it was a lentle-icular?
<b>: Re: Give peas a chance!</b> <b>: fluffyporcupine August 12, 2007, 05:02:22 PM</b>
*graon* :( hehehe ;D

**Figure 4.7**

The interaction between users in Figure 4.7 provides an example of the playfulness of some of the posts in the forum. In this interaction, the two users play on different spellings of descriptors (“pulse-ah!” and “lentle-icular?”). The usage of the winking-face emoticon [;)] seems to preclude any interpretation of

this posting as serious. The response is an acknowledgment of that playfulness (“\*graon\*” and “hehehe”). The usage of the crying sad-face emoticon [:(] and the winky-face smiling emoticon [;D] confirms the unserious nature of the suggestion in the post. These emoticon interactions occurred frequently throughout the forum; however, beyond serving as a function of tone, their usage was not significant to my research project at this time.

Still, I would be remiss not to mention or code some of the emoticon replies because they do function as a rhetorical act, even if that act was to only confirm a posting was read. In most cases, an emoticon reply was used alongside a basic or developed link and/or with a text reply (see Figure 4.8).



**Figure 4.8**

This type of communication was typical of the early internet, and it has stayed with each iteration of digital communication. In Figure 4.8, the user seems to offer congratulations for the discovery of a GPG with a particular Z-value (a type of SDSS-produced value) while also offering some disgruntlement using the slash-face emoticon [:-\].

These emoticons play a role in communication on the internet and through digital devices; however, for the purposes of knowledge creation and authority

building, I am unsure of the effectiveness of such usage. Emoticons are used as a form of interpersonal communication and focus on augmenting other communication practices in the forum, but such usage in the construction of authority is unknown.

A text reply is a reply where the user posts words or sentence-length text. Most often, this text is used to contextualize the user's post. There tend to be two different types of text replies. The first type of text reply is one in which the user is engaging in playful banter that may or may not be relevant to the overall focus of the forum. The second type of reply is one in which the user is directly referencing or explaining their GPG example. These types of replies are the most useful for rhetorical analysis, and I further refine them into specific rhetorical moves, which I explore later in this chapter.

I have already highlighted some of the playful banter that appears in the forum; however, at the textual level, this playful banter does function as meaningful interpersonal communication and not merely phatic communication. Building relationships through communication can eventually lead to authority, expertise, and trust. These interactions and rhetorical acts evoke the potential for community beyond simply belonging to a digital space.

<p><b>: Re: Give peas a chance!</b>  <b>: cpt.Bear August 18, 2007, 07:42:57 PM</b></p> <p>Yay! I got one!  More pea soup please!  z= 3.783  zConf= 0.95  Galaxy Ref: 587725471199986131  (<a href="http://casjobs.sdss.org/ImgCutoutDR6/getjpeg.aspx?ra=116.68560067&amp;dec=39.96382083&amp;scale=0.09903&amp;width=400&amp;height=400&amp;opt=&amp;query=">http://casjobs.sdss.org/ImgCutoutDR6/getjpeg.aspx?ra=116.68560067&amp;dec=39.96382083&amp;scale=0.09903&amp;width=400&amp;height=400&amp;opt=&amp;query=</a>)</p>
<p><b>: Re: Give peas a chance!</b>  <b>: marke August 19, 2007, 08:02:31 PM</b></p> <p>hi, not sure if this is what your looking for, but heres a nice collection of greens anyway...</p> <p>(<a href="http://casjobs.sdss.org/ImgCutoutDR6/getjpeg.aspx?ra=135.1199537&amp;dec=11.77876032&amp;scale=1.584508&amp;width=512&amp;height=512&amp;opt=&amp;query=">http://casjobs.sdss.org/ImgCutoutDR6/getjpeg.aspx?ra=135.1199537&amp;dec=11.77876032&amp;scale=1.584508&amp;width=512&amp;height=512&amp;opt=&amp;query=</a>)  <a href="http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587745540511432980">http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587745540511432980</a></p>
<p><b>: Re: Give peas a chance!</b>  <b>: lboynton August 19, 2007, 08:22:23 PM</b></p> <p>Just thought I'd toss one into the soup! z=4.10 Get 'em while they're hot! :D</p> <p>587741816777146521  (<a href="http://casjobs.sdss.org/ImgCutoutDR6/getjpeg.aspx?ra=137.68750072&amp;dec=17.7420284&amp;scale=0.09903&amp;width=512&amp;height=512&amp;opt=&amp;query=">http://casjobs.sdss.org/ImgCutoutDR6/getjpeg.aspx?ra=137.68750072&amp;dec=17.7420284&amp;scale=0.09903&amp;width=512&amp;height=512&amp;opt=&amp;query=</a>)</p>

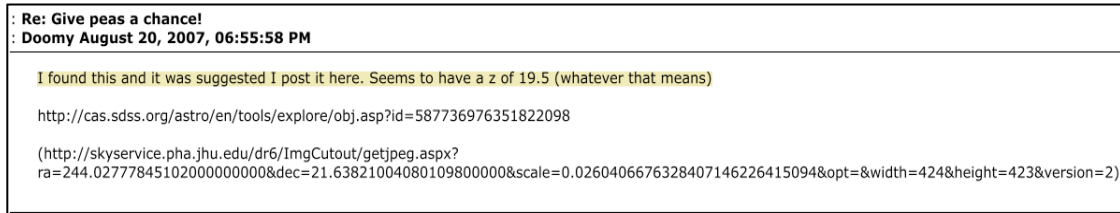
**Figure 4.9**

In Figure 4.9, text replies form the foundation and continuation of a common playfulness among users in the entire discussion forum. The users play on discovering peas and then throwing them into “pea soup” or “the soup.” This metaphorical space—that is, the soup—provides continued inspiration for discussion among users. In some instances, such discussions seem more informed by competition than any search for categorization or knowledge. The goal seems to become focused on who can find as many examples of GPGs as possible. This lighthearted competition is emboldened by the playful text replies and offers some context as to what each user has found.

Some text replies are referrals from other Zooniverse forums. These types of text replies occur a few times within the discussion forum, and such replies highlight the interconnectedness of the Zooniverse system. As I mentioned during my discussion of digital space, the relationship between the Zooniverse



system and SDSS system is instrumental to the construction of authority within the systems. Each system lends its authority to forum users.

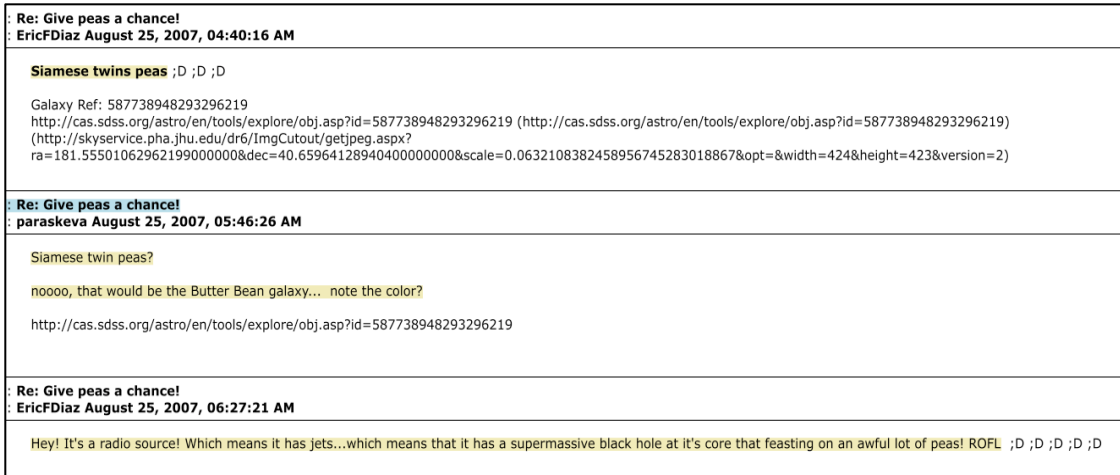


**Figure 4.10**

Since authority cannot develop outside of social relationships, these referral posts become important; however, as each reply builds upon each previous reply in the initial discussion forum thread, the referral from outside discussion threads (that is, non-GPG threads) becomes less important. Users within the discussion thread are forming a localized knowledge community (Brown and Duguid 151-157) and the text replies that they make tend to be organized around specific rhetorical moves (more on this later).

Often, the text replies contain specific contextual information that is based in outside expertise rather than in localized authority. For example, in Figure 4.10, the user not only refers to a suggestion to post in the GPG forum but also includes a specific classification element (“Seems to have a z of 19.5”) even though the user is ignorant to a Z-value’s definition. The initial post in the discussion forum began with an emoticon, but later postings by the same user articulated a surprise that other users continued to post (see Figure 4.11).





**Figure 4.13**

Figure 4.13 provides a clear example of the definitional work that occurs in the forum. This interaction suggests disagreement about exactly what has been posted and whether or not the example is a GPG. This type of text reply is common in the discussion forum. The users are negotiating the characteristics of a GPG. Within the discussion forum, there has yet to be a clear articulation of what constitutes a GPG. An articulation occurs later through which each example of a GPG is evaluated, and I will discuss these characteristics in more detail when I examine the rhetorical moves in the forum.

Throughout the discussion forum, users engage in various types of text replies, including replies of approval, disapproval, questioning, declaring, and hedging. These replies are based in text and provide critical context to the forum's authority-building nature. There cannot be authority-building without interpersonal communication or some other type of dialogue. There must be an interaction in order to receive feedback on a user's message. This interaction is often completed through specific rhetorical moves, which I explore next.

## ***Rhetorical Moves***

In coding the reply styles of the discussion forum posts, I noticed two specific subcategories of rhetorical moves: hedging and declaring<sup>6</sup>. I did not make rhetorical moves a subcategory of reply style, though I could have easily done so. The reply style coding category is broad and encompasses more than rhetorical moves. In this case, reply style can be understood as the form a response takes while rhetorical moves can be understood as the interactive strategy within that form.

Hedging is a rhetorical move in which the user is not sure of a claim or outcome. Hedging is quite common in academic discourse, especially in scientific discourse. Hedging is also a form of negotiating, and this type of rhetorical move appeared often in the raw data. In the forum data, hedging seemed to serve several functions. A user might hedge as polite disagreement, or a user might hedge as a discomfort in identification abilities.

<b>Re: Give peas a chance!</b> <b>fluffyporcupine August 21, 2007, 06:06:09 PM</b>
random green pea like object i think. Some are stars some are possible quasars... some maybe alien bogies ;)

***Figure 4.14***

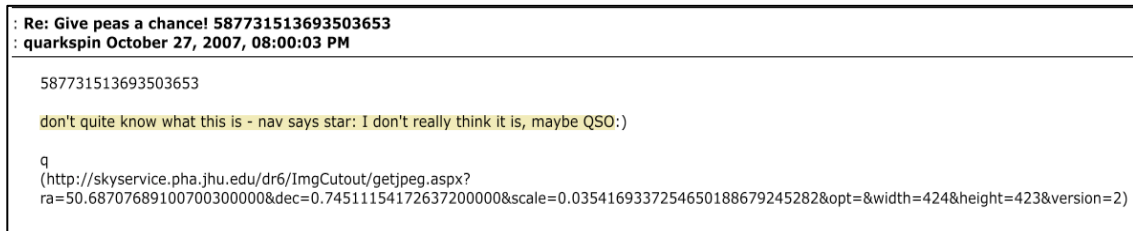
In Figure 4.14, the user engages in hedging. Phrases or sentence constructions that include some type of doubt are often examples of hedging. The user's "I

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<sup>6</sup> There is relevant sociolinguistic literature (Penelope Brown and Stephen Levinson; J.L. Austin; and John Searle) related to speech act theory that speaks to hedging and declaring; however, I take a less restrictive approach to the concepts of hedging and declaring than speech act theory. Moreover, as I am interested in the persuasive nature of language, I find the understanding of these terms as rhetorical moves more beneficial to my specific case study. However, speech act theory may benefit future analyses of my data.

think” in Figure 4.14 is an example of doubt. In this example, the user is responding to a post where another user asks about what constitutes a GPG. The example in Figure 4.14 does two things: It hedges and clarifies. Later in the forum, users formulate characteristics or criteria of GPGs, and the clarification provided in this example will prove to be only partly correct.

Some users hedged when a disagreement arose with classification. When a user disagreed with how the SDSS system classified an object, that user might engage in hedging because they are working from localized knowledge or accounting for localized interpretive context (Geisler 25-27). If the SDSS system carries a certain amount of authority within its space, challenging that authority would be a risk and require hedging.



**Figure 4.15**

In Figure 4.15, the user is unsure of how the SDSS system classified an object (“don’t quite know what this is - nav says star”) and disagrees with the system’s classification by hedging (“I don’t really think it is”). As the forum progressed, users became bolder in disagreeing with the established system classifications and created a rudimentary system of classification by articulating what a GPG is not rather than what a GPG is.

<p><b>: Re: Give peas a chance!</b>  <b>: Half65 November 29, 2007, 05:02:49 PM</b></p> <p>First one, probably not very good  <a href="http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587722983366328505">http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587722983366328505</a>        (http://skyservice.pha.jhu.edu/dr6/ImgCutout/getjpeg.aspx?        ra=215.7429759833870000000&amp;dec=0.05692701828630859000&amp;scale=0.0850043150613892759433962263&amp;opt=&amp;width=424&amp;height=423&amp;version=2)</p>
<p><b>: Re: Give peas a chance!</b>  <b>: Half65 November 29, 2007, 05:13:29 PM</b></p> <p>another one not very spherical  <a href="http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587729387674468712">http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587729387674468712</a>        (http://skyservice.pha.jhu.edu/dr6/ImgCutout/getjpeg.aspx?        ra=129.6959638619540000000&amp;dec=45.41549277610980100000&amp;scale=0.0486374463675157075471698112&amp;opt=&amp;width=424&amp;height=423&amp;version=2)</p>
<p><b>: Re: Give peas a chance!</b>  <b>: Half65 November 29, 2007, 05:19:16 PM</b></p> <p>Not very green  <a href="http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587729387674468712">http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587729387674468712</a>        (http://skyservice.pha.jhu.edu/dr6/ImgCutout/getjpeg.aspx?        ra=129.6959638619540000000&amp;dec=45.41549277610980100000&amp;scale=0.0486374463675157075471698112&amp;opt=&amp;width=424&amp;height=423&amp;version=2)</p>

**Figure 4.16**

The entire function of the discussion forum thread became a rhetorical act for finding and classifying GPGs. In Figure 4.16, a user posts three examples but qualifies those examples through hedging. The type of hedging that appears is based on the user's seeming lack of knowledge. If the user were sure of the GPG example, the user would declare the discovery without hesitation; however, in Figure 4.16, the user discounts the example ("probably not very good") and disqualifies the example ("not very spherical" and "not very green"). Before other users have the chance to investigate each of these examples, users must read through this hedging. In this case, the user who posted the examples seems to leave it to other users to decide for themselves whether the examples are or are not GPGs.

<p><b>: Re: Give peas a chance!</b>  <b>: ElisabethB January 04, 2008, 11:03:18 AM</b></p> <p>posted somewhere else, but it looks like a typical pea to me.        587739652107600089 (http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587739652107600089)</p>
--

**Figure 4.17**

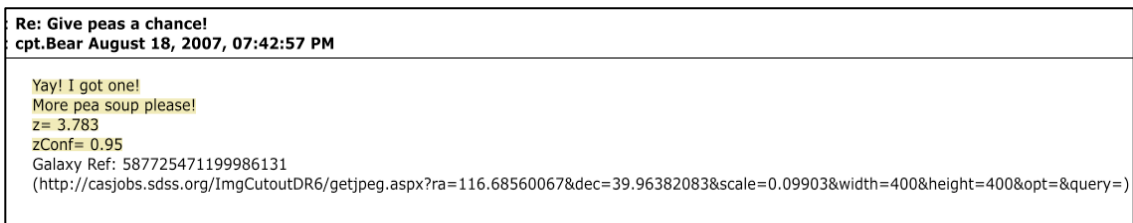
There are instances within the discussion forum where a user brings in a reference from a different Zooniverse forum. In Figure 4.17, the user posts a GPG example from a different forum (“posted somewhere else”), but the user then hedges (“it looks like”). This hedging is referencing the visual appearance of the example. The driving description of a GPG is that it must be some hue of green, it must be spherical in shape, and it must be a galaxy-type object. The characteristics of GPG are eventually articulated with more specific criteria, but, in Figure 4.17, the user is still laboring under the most basic of characteristics with no further inquiry.

As a rhetorical move, hedging is doing considerable work in building authority. Within the forum, hedging appears to act as a form of doubt in search of confirmation. I cannot say whether this doubt is planned or not. Hedging did produce the most interaction. As I argued earlier, links are an invitation to interaction and inherently authoritative, and the same can be said about the rhetorical move of hedging in this forum. Hedging calls for a response from other users, but hedging was not the only rhetorical move.

Declaring is a rhetorical move in which the user is confident and assured in a claim or outcome. Declaring appears less often in academic and scientific discourse. Scholars are often taught to carefully argue a position within specific venues and under specific circumstances. Journalistic writing is more declarative than academic discourse, which, given differing audience expectations, makes sense. Declaring is not confirming. I want to make that distinction because I am interpreting confirmation as a rhetorical move based on established authority and

expertise. Declaration is a rhetorical move based on confidence in a claim even though that claim may not conform to or reference the characteristics necessary for confirmation.

Some users in the discussion forum were confident about their discoveries. Instead of hedging, these users declared their discovery. This type of rhetorical move often left little room for engagement or interpretation by other users; however, this did not preclude disagreement among users of whether a posting was an example of a GPG. In some cases, users posted a declaration using specific characteristics that would later be codified as the characteristics of GPGs.



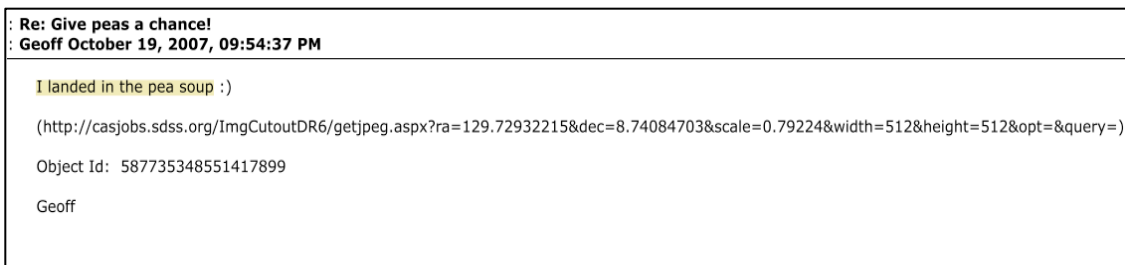
**Figure 4.18**

In Figure 4.18, the user declares their discovery in a way that is confident and assertive (“Yay! I got one!”). That is, the user is confident in the GPG example provided. In this case, the user posts two of the values provided by the SDSS system: the Z-value and the ZConf-value. These values serve as evidence or support for the user’s discovery, which, in turn, makes the claim of a GPG all the more authoritative. The values the user posted would later become important as characteristics of a GPG, by which all GPGs would be evaluated. This is an example of the rhetorical move employed by the user organically supporting the



confidence of the discovery. This user is building authority within this community through distinct rhetorical reasoning.

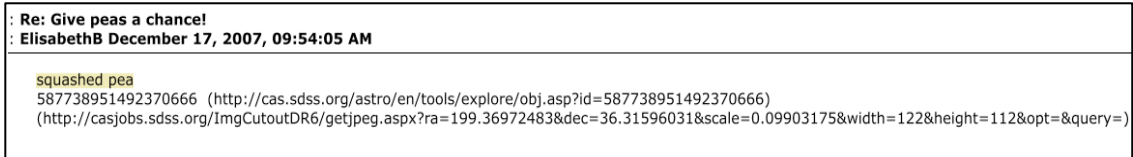
Other users posted text replies that were declarative in different ways. The sense of assuredness among users became more obvious over time. As long as users continued to post examples of GPGs, the more assured in those posts the users became. This is not to suggest, of course, that the users were always correct, especially when the final characteristics and criteria were finally articulated and applied; however, recalling *The Phaedrus*, the appearance of authority may be just as effective as actual authority.



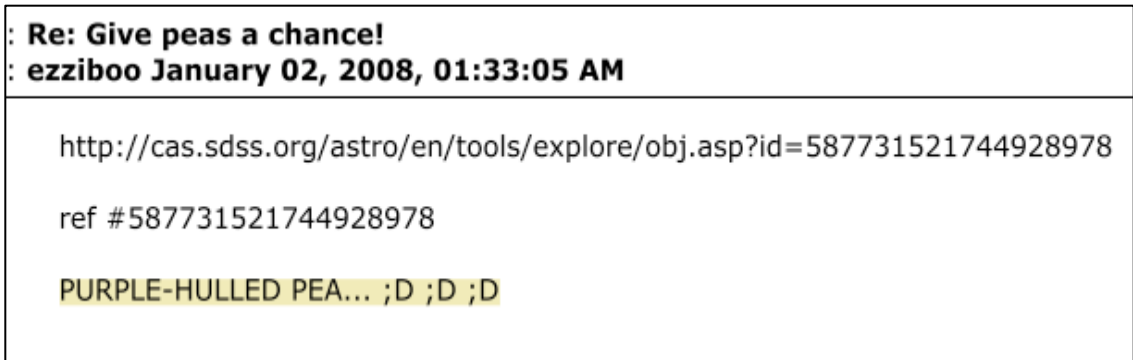
**Figure 4.19**

A user posted a developed reference with a declarative (see Figure 4.19). In this instance, the user does not indicate that he found a pea directly, but, rather, the user suggests the discovery of many GPGs. If another user followed the posted link, there are many examples of GPGs. This user, however, did not specify any of the criteria that would later become critical to identifying GPGs, though the user did post an Object ID so the reference could easily be found. Most posts coded as declaring look like Figure 4.19. The lack of hedging or doubt is apparent, but there is no confirmation.

In many cases, the rhetorical move of declaring came with contextualizing information. Before a codified list of characteristics was created, a rudimentary classification system based on color and shape developed among users. Since the characteristics most users could reply on were visually-based, this type of system made sense.



**Figure 4.20**



**Figure 4.21**

Figures 4.20 and 4.21 speak to the system of visually-based characteristics. In both of these figures, the users declare that they have discovered a GPG but offer different visually-based characteristics to articulate their discoveries: “squashed pea” and “PURPLE-HULLED PEA.” These characteristics are only observable when the link is followed or when an image from the SDSS is posted. There was later some disagreement about the question whether a GPG must be green. When a codified list was finally created, one of the characteristics is the appearance of green but not a specific shade of green.

The rhetorical move of declaring appears to be critical to the building of authority. However, as mentioned previously, the appearance of authority is the only thing assured by the declarative-nature of some posts. Still, such posts do serve an important function. These posts contribute to the collection of examples of potential GPGs. This collection can be examined, analyzed, and discussed at length by researchers. Both rhetorical moves of hedging and declaring lead to the eventual classification system on which GPGs are evaluated. These types of rhetorical moves aid in the construction of authority in that they are elements employed by discussion forum users to make claims beyond a common understanding (Geisler 53-55).

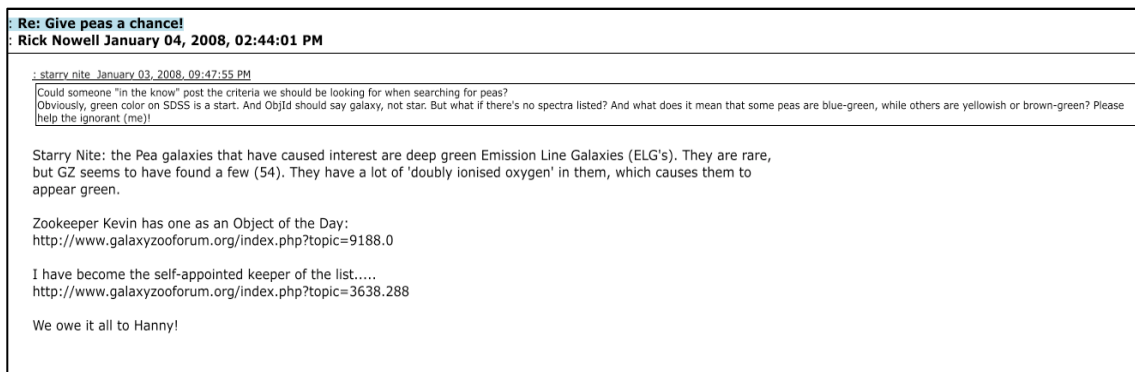
### ***Characteristics of a Green Pea Galaxy***

Eventually, after examples followed by discussion, a user queried the discussion forum for more discrete criteria for GPGs. The definition of terms became paramount for some users because it helped in the discoveries of legitimate GPGs. Most defining characteristics until the request for clearer criteria had been determined by only the visually-based aspects of the GPGs. Users labored under these aspects with only minimal reference to any other classifications. Most of the references to criteria, as I indicated earlier in this chapter, were based on what a GPG was not rather than what a GPG was.

<p><b>Re: Give peas a chance!</b> starry nite January 03, 2008, 09:47:55 PM</p> <p>Could someone "in the know" post the criteria we should be looking for when searching for peas? Obviously, green color on SDSS is a start. And ObjId should say galaxy, not star. But what if there's no spectra listed? And what does it mean that some peas are blue-green, while others are yellowish or brown-green? Please help the ignorant (me)!</p>
--

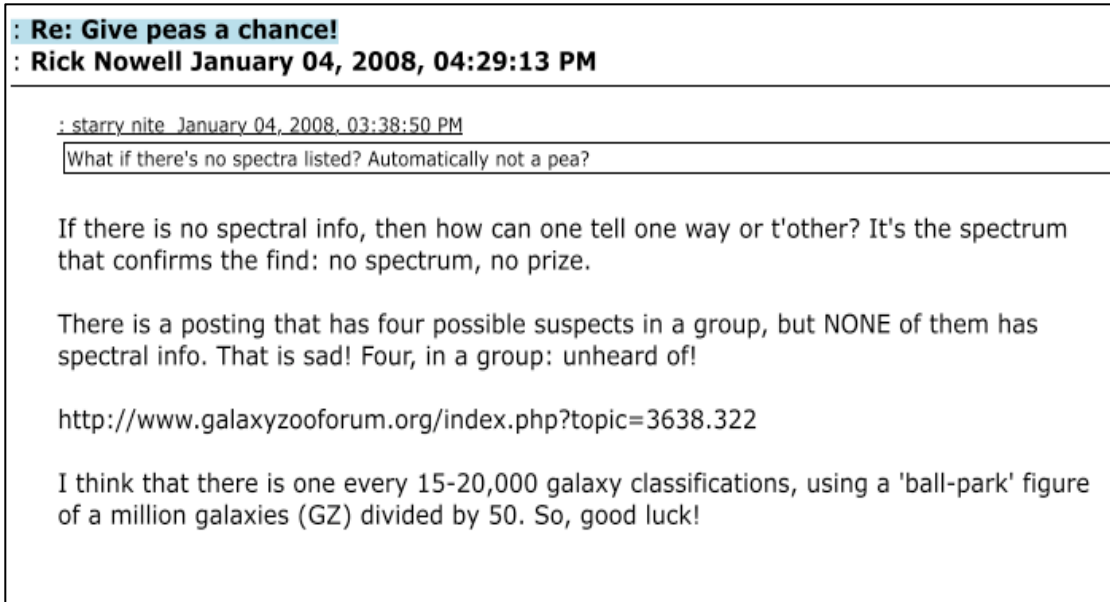
***Figure 4.22***

In Figure 4.22, a user posts the first request for other users (“in the know”) to state exact criteria of a GPG. The reference to a knowledgeable user is an example of appealing to a user’s authority to speak on a subject. This is the most direct appeal to authority in the coded data. The user offers what is already known about the characteristics of a GPG. In the forum, this is the moment when the hedging and declaring of characteristics moves from defining a GPG as what it is not to what it is. Despite this response, there continued to be discussions about the characteristics of a GPG. Another user responded to the user in Figure 4.22 with basic criteria on which to evaluate potential GPGs.



**Figure 4.23**

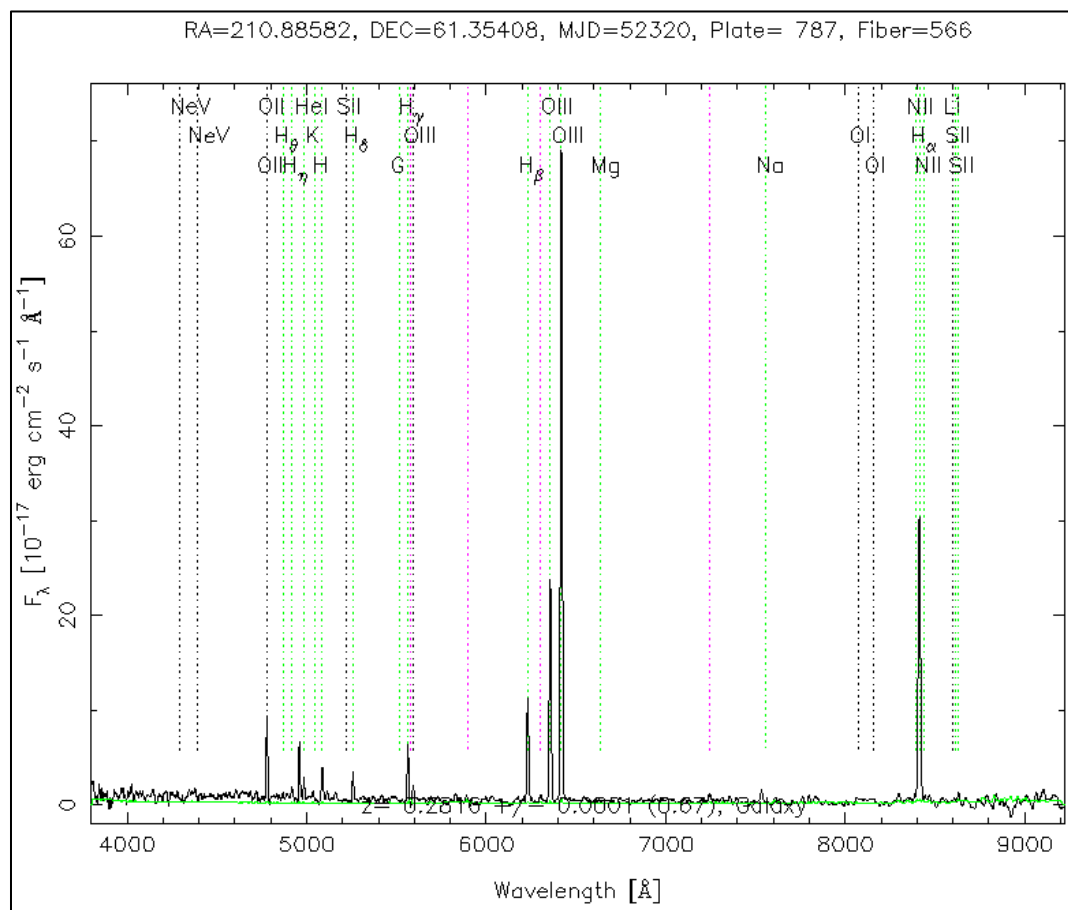
In Figure 4.23, the user articulates one basic criteria of the type of pea galaxies the discussion forum is based on: “[t]he pea galaxies that have caused interest are deep green Emission Line Galaxies (ELG’s).” The user indicates such galaxies are rare, with a count of 54 confirmed cases that meet the posted criteria. The same user in Figure 4.23 articulates further criteria with a major disqualifying factor for what counts as a GPG and what does not count as a GPG.



**Figure 4.24**

The user in Figure 4.23 and 4.24 articulated the importance of the spectral information. It is in the spectral information that a user could positively identify a legitimate GPG. From this moment forward, GPGs would be evaluated on the green appearance and the spectral information. As the user suggests, without any spectral information, a GPG could not be positively identified. In this way, the users declarative statement became a measure against which all potential GPGs would be graded. The development of this criteria also meant that some users who posted examples of potential GPGs would never have their examples confirmed as such because some of those examples lacked spectral information. The SDSS system provides the spectral information to users. Such information is beyond the lay researchers reach and control.

The articulation of criteria in Figures 4.23 and 4.24 follows an earlier post from a different forum by a member of the Zooniverse science team. In that post<sup>7</sup>, the science team member wrote, “Peas are galaxies with enormously powerful emission lines.” The powerfulness of the emission lines is what first draws the attention of members of the Zooniverse science team (that is, the traditionally-trained experts).



**Figure 4.25**

<sup>7</sup> See Zooniverse forum titled “What is this green colored thingy?” (<https://www.galaxyzooforum.org/index.php?topic=8926.msg88388#msg88388>)

In Figure 4.25, you can see the powerful emission lines that became one of the criteria for a GPG. The large black line in the middle of the spectral information is indicative of a GPG, and it is a characteristic that became a determining criterion for a GPG; however, this was not the only criterion. Users of the forum continued to develop their own criteria to evaluate GPGs, but the emission line in Figure 4.25 became part of the forum users' criteria.

Indeed, almost immediately after the posting of emission line criterion, it was used to disqualify potential GPGs (see Figure 4.26). The immediate effect of this criterion became critical to evaluating every GPG from that moment forward. The forum users developed characteristics of potential GPGs, and, in most cases, the characteristics they developed were later supported by scientific researchers (Cardamone et al).

<p><b>Re: Give peas a chance!</b>  <b>rinscewind January 14, 2008, 07:12:07 AM</b></p> <p>(<a href="http://www.galaxyzoo.org/images/bias/MIRd/587741532789080194.jpeg">http://www.galaxyzoo.org/images/bias/MIRd/587741532789080194.jpeg</a>)  587741532789080194  <a href="http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587741532789080194">http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587741532789080194</a> (<a href="http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587741532789080194">http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587741532789080194</a>)</p>
<p><b>Re: Give peas a chance!</b>  <b>rinscewind January 14, 2008, 07:15:18 AM</b></p> <p>(<a href="http://www.galaxyzoo.org/images/bias/MIRd/587738951492370666.jpeg">http://www.galaxyzoo.org/images/bias/MIRd/587738951492370666.jpeg</a>)  587738951492370666  <a href="http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587738951492370666">http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587738951492370666</a> (<a href="http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587738951492370666">http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587738951492370666</a>)</p>
<p><b>Re: Give peas a chance!</b>  <b>Stefan W. January 14, 2008, 07:27:06 AM</b></p> <p>@ <b>rinscewind</b> :  Sorry to say, but both are <i>not</i> "peas" - they don't have strong OII/OIII-emission lines, but look like rather ordinary galaxies. (Ok, one is a xray, the other a radio source, but nothing special concerning emission lines as far as I can see ...)</p>

**Figure 4.26**

While the availability of spectral information became a determining criterion, the lack of such information did not dissuade some users from posting examples of potential GPGs if those users strongly believed the examples could be a GPG

anyway. Even though the criteria were developing further, the initial criteria developed by users still drove the search for more GPGs.

<p>: <b>Re: Give peas a chance!</b> : <b>starry nite January 26, 2008, 02:23:28 AM</b></p> <p>No spectral chart, so I can't say it's a pea...AND, it's near a star effect. But still, I don't think that vivid green is just an artifact. (<a href="http://casjobs.sdss.org/ImgCutoutDR6/getjpeg.aspx?ra=11.46562&amp;dec=15.48282&amp;scale=0.1981&amp;width=512&amp;height=512&amp;opt=S&amp;query=&amp;SpecObjs=on">http://casjobs.sdss.org/ImgCutoutDR6/getjpeg.aspx?ra=11.46562&amp;dec=15.48282&amp;scale=0.1981&amp;width=512&amp;height=512&amp;opt=S&amp;query=&amp;SpecObjs=on</a>) ra=11.46568337, dec=15.48258739, ObjId = 587724199349911792 <a href="http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587724199349911792">http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587724199349911792</a> (<a href="http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587724199349911792">http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587724199349911792</a>)</p>
---

**Figure 4.27**

Some users continued to post potential examples of GPGs to the forum, even though those examples did not have the required spectral information that became the standard for evaluation. The user in Figure 4.27 posted an example indicating that the example did not meet the requirement for spectral information but that the example was still a GPG based solely on its visual representation. Based on this user's experience, the example must be a GPG.

After numerous postings, the user in Figure 4.27 articulated criteria against which GPGs could be evaluated. These criteria arose out of the forum and the users' engagement with spectral information. These criteria still incorporated the visually-based elements that began the entire forum; however, at this point, the criteria started to become more scientific, relying on more traditional expertise. In short, the forum users began to adopt the language of science to create, define, and justify their discovery.



: Re: Give peas a chance!  
 : starry nite February 03, 2008, 01:53:52 PM

Thanks, **Galaxy Hunters Inc.**  
 Now, to prove that I'm not obsessed with them, a list of all the Peas with spectral charts arranged by z-shift:

[Edit: moved the list here: <http://www.galaxyzooforum.org/index.php?topic=3638.msg108116#msg108116> (<http://www.galaxyzooforum.org/index.php?topic=3638.msg108116#msg108116>)]

Characteristics of a "Pea" galaxy A.K.A. OIII galaxy:

1. Mostly-flat spectral chart except for:
2. An extreme peak at OIII (double-ionized oxygen emission line);
3. If there is a peak at OII, it must be shorter than the OIII peak;
4. Other peaks must all be smaller than the OIII;
5. Any H-peaks should be narrow, not wide-based which might indicate a quasar (with a redshift  $z < 0.3$ );
6. Redshift range ( $z$ ) of approximately 0.14 - 0.35 for a green color on SDSS;

**Figure 4.28**

The criteria for GPGs is articulated in Figure 4.28. This codification provided users from that moment forward a classification system to justify their discoveries and identify potential GPGs. This same system would later be adopted by Zooniverse's scientific researchers (Cardamone et al.). The adoption by traditionally-trained experts of the system created by lay researchers is a testament to the forum users' construction of authority. Through a process of discussion, users were able to define and refine the characteristics of a GPG. This process culminated in the creation of standardized criteria by the user in Figure 4.28.

Each of the criteria listed in Figure 4.28 is available through the SDSS system and spectral information. So, once more, without spectral information, there can be no confirmation that an example of a GPG is legitimate. By the time of this criteria standardization, users had found 54 confirmed and legitimate examples of GPGs. Despite the 100s of postings up to this point, only 54 could be certified based on the standardized criteria.

As seen through the coding, the importance of specific rhetorical moves in the construction of authority is notable. Users made decisions in the forum that affected the discovery, users investigated elements of the discovery, and users

sought outside confirmation when necessary. The users had no idea that they had stumbled upon something unique until an outside Zooniverse scientific researcher suggested something strange was happening. The users within the forum created their own community with its own rules and authoritative system to evaluate their discovery. The fact that they did not approach the uniqueness of their discovery but still investigated it indicates an engagement and interactivity within the community based on the development of shared knowledge and interest.

### ***Chapter Summary***

In this chapter, I have discussed my coding of forum data as well as conducted analysis of the forum data with a focus on authority. I have offered examples of the type of discourse users employed to identify and construct criteria against which they evaluate their discovery of the Green Pea Galaxy. In this analysis, I argued that users employed specific rhetorical moves (declaring and hedging) to negotiate criteria and position themselves. These rhetorical moves led to the creation of criteria that would later be used by traditionally-trained experts, providing the forum users a modicum of authority.

In my next chapter, I will develop a framework through which the localized knowledge community of the discussion forum became a space of localized authority and expertise. I will further discuss potential future avenues for my research and theorize on its implications for internet-based communication.

## **Chapter 5: Expertise in Localized Knowledge Communities**

In this chapter, I will explore the interpretations of my previous chapters, further analyze and theorize my findings, and suggest future avenues for research. I will reflect on my research and consider the positive and negative aspects of conducting research in digital spaces using rhetorical analysis and case study methods, and I will articulate the place of my research questions and goals within specific contemporary issues.

As I worked through 640 discussion forum posts, my understanding of the data and interactions between users changed. I approached coding and research with an open perspective, but there are some interactions that seemed to confirm my own experiences in interacting and negotiating discourse in online environments. I was influenced by my own experiences, but I was also influenced by the experiences and perspectives of my dissertation committee, especially my doctoral advisor; my colleagues across the disciplines; and my students in both face-to-face and online courses.

For my future research, I began to observe online interactions in other internet-based spaces that mimic the types of interactions I observed in the Green Pea Galaxy (GPG) discussion forums. Contemporary political events also started to take on new meaning for me, and, perhaps fortuitously, my research and interest in the conceptions and enactments of authority appear especially relevant to issues of misinformation, disinformation, and propaganda in twenty-first century political communication. The discussion forum posts should be understood in context, but the rhetorical techniques applied by users are

important and, potentially, useful in various other spaces, including political communication, online learning, and social networking.

In order to understand how my analysis contributed to conceptions of authority and, by extension, expertise, I will revisit my initial research questions:

1. How do nonexperts create expertise?
  - a. How is authority established and maintained by participants in the discussion forum?
  - b. How does the discovery of the Green Pea Galaxy through an online discussion forum demonstrate the rhetorical import of contemporary crowdsourced knowledge projects?

In the following sections of this chapter, I will outline how I answered these questions.

### ***Authority and the Place of Expertise***

In reviewing the discussions in the GPG forum, it was apparent that the concept of expertise was present. The entire function of the discussion forum served, in the end, as a wall to which traditionally-trained experts could bounce ideas and discover the undiscovered. Throughout my coding, I kept the work of Cheryl Geisler in my mind. As noted in my Chapter 1 literature review, Geisler has dedicated a considerable portion of her work to the idea of authority and expertise. Her work is similar to mine in this dissertation in that we are both concerned with the idea of authority (understood as ethos) and the way authority leads to expertise. That is, like Geisler, I am interested in the route one takes to

become an expert. The rhetorical moves and acts that guide someone to develop over time an expertise is of particular import. So, why is it important?

We place a lot of trust in those who claim expertise. Humans seem to enjoy authority in both the political and rhetorical sense. Indeed, one of the goals of attaining a PhD is to become invested with authority and expertise in a subject. That is part of the deal. However, not all authority is earned; some authority is granted. For those who are granted authority, expertise is not always relevant. Some people are granted authority—or a modicum of authority—simply because they have power or money. Those individuals buy their authority. Knowing this, the line between authority and expertise becomes a bit clearer: Authority can be granted, while expertise cannot. Expertise must be earned, and there is a process through which it can be earned.

I spent considerable time in previous chapters arguing that the construction of authority is always driven by rhetoric. We use language to define, categorize, and codify the parameters and the contours of authority. Since authority is contextual, it is inherently community-based, and communities are based in spaces and places. As I moved through the discussion forum, it became clear to me that the difference between authority and expertise is smaller than I anticipated. Regardless, both authority and expertise are beholden to contextual issues that are static in the case but dynamic in the overall considerations of internet-based communication.

In my analysis, the question of how and in what ways authority is established and maintained were answered—in part. The presence of rhetorical

moves in discussion forum users' posts is clear. Hedging as a rhetorical move played a huge role in the establishment of authority among users. The contribution to the ongoing collection of GPGs showed a level of engagement indicative of using authority to build expertise. The rhetorical act of posting a link and, in practice, creating a collection of examples is itself an authority-building exercise. The specific nature of the GPG discovery illustrates that nontraditionally-trained researchers can become authorities and experts within specific localized contexts. While I coded and analyzed only 640 discussion posts, those posts leading up to the codification of GPG characteristics showed the importance of organic and self-organizing crowdsource knowledge projects.

Users within the forum defined, categorized, and codified the criteria for identifying GPGs. Within those 640 discussion forum posts, users had minimal interaction with established experts. They used a space within a community (that is, Zooniverse) to *process* a discovery. What do I mean by *process*? I mean, the construction of authority is a process in the way that rhetoric itself is a process. There is a process to rhetoric, a process to authority, and a process of expertise.

### ***The Process of Expertise***

The space and place of Zooniverse contributed in many ways to the inherent authority of the users within it. Zooniverse afforded users a patina of respectability and trust. The users built their own authority upon the authority of the Zooniverse system. It was an example of authority built upon authority, but, as I suggested previously, authority does not denote expertise. The construction of authority is an element in the process leading to expertise. Along this process,

there are elements, such as motivation and persistence, that contribute to the movement within the process. Rhetorically, language undergirds the process through which one becomes an expert. My overarching concern in this dissertation and beyond is one of the creation of experts. Or, rather, how and in what ways do nonexperts create expertise? It is a question far too large to be answered by one research project; however, through my analysis, there is something to be learned about the process of nonexperts becoming experts within specific circumstances.

My research project is benefited by the concrete knowledge that traditionally trained experts confirmed the discovery of the nonexpert users in the discussion forum (Cardamone et al). As I indicated in Chapter 2, numerous articles and research studies have been conducted by scientists based on the discovery declared in the GPG discussion forum. That is not in doubt. Still, the considerations of creating and maintaining enough authority to tacitly argue the discovery of a new galactic object is profound and not clearly articulated in the scientific work produced from the discovery. There is a level of training that goes into expertise. It is not a matter of inherent ability but, rather, a matter of inherent drive. That is, users are seemingly driven to explore and discover, and it is in this continued drive that one can develop a level of expertise within specific communities. These specific communities, or domains, produce individuals interested in pursuits of knowledge that may be only cursorily related to their other interests. This is one of the great affordances of crowdsourced knowledge

projects: Such projects attract participants from different facets of society and for different reasons.

Through rhetoric, nonexperts can create expertise, but that expertise is so localized that it may not be applicable outside of the context in which it was created. Perhaps the skills developed in the process of expertise are transferable in some way. Those skills might include critical observation and thinking, followed by a type of application in relation to established knowledge practices. In the case of the GPG, the process from discovery to expertise is muddled; however, the process might look something like a series of rote steps through which users become knowledgeable enough in specific content that they cannot only define said content but also dissect said content. That is, I suggest expertise is not only the ability to apply authoritative knowledge but also the ability to recognize when to apply only part of that knowledge based on the contextual issues present.

In Geisler's work on academic expertise, she articulates an understanding of expertise as domains of knowledge that are separate from each other but that can become intertwined. These domains are inhabited by both nonexperts and experts, and there is a line between them. This line is what separates lay knowledge and expert knowledge. This "dual problem space framework" articulates an understanding lay knowledge and expert knowledge when individuals are asked to apply expertise to nebulously defined domains (82-88). For Geisler, expertise is about both domain content knowledge and rhetorical process. I have argued something similar, but I would now like to depart from Geisler in part.



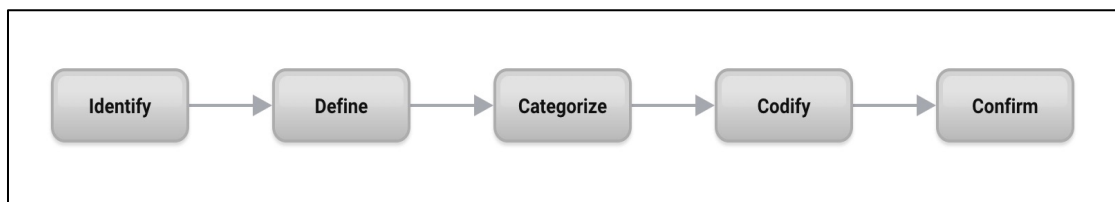
The discussion forum users constructed authority by referencing information and then codifying criteria which they used to evaluate that information. The process of referencing examples from the Sloan Digital Sky Survey (SDSS), posting those examples within a specific digital space, and defining those examples through discussion is authority-building. The process of applying the definitions created and codifying the criteria through which those examples and definitions can be evaluated is expertise-building. The difference between collecting information and applying information is the difference between authority and expertise. I draw this distinction because one can know a lot about a topic but not know how to apply that knowledge. For example: In one post (listed as Figure 4.9) I highlight in Chapter 4, users post links to SDSS examples but then hedge in characterizing those examples. That hedging becomes important to positioning within domain content.

<p><b>: Re: Give peas a chance!</b>  <b>: cpt.Bear August 18, 2007, 07:42:57 PM</b></p> <p>Yay! I got one!  More pea soup please!  z= 3.783  zConf= 0.95  Galaxy Ref: 587725471199986131  (<a href="http://casjobs.sdss.org/ImgCutoutDR6/getjpeg.aspx?ra=116.68560067&amp;dec=39.96382083&amp;scale=0.09903&amp;width=400&amp;height=400&amp;opt=&amp;query=">http://casjobs.sdss.org/ImgCutoutDR6/getjpeg.aspx?ra=116.68560067&amp;dec=39.96382083&amp;scale=0.09903&amp;width=400&amp;height=400&amp;opt=&amp;query=</a>)</p>
<p><b>: Re: Give peas a chance!</b>  <b>: marke August 19, 2007, 08:02:31 PM</b></p> <p>hi, not sure if this is what your looking for, but heres a nice collection of greens anyway...</p> <p>(<a href="http://casjobs.sdss.org/ImgCutoutDR6/getjpeg.aspx?ra=135.1199537&amp;dec=11.77876032&amp;scale=1.584508&amp;width=512&amp;height=512&amp;opt=&amp;query=">http://casjobs.sdss.org/ImgCutoutDR6/getjpeg.aspx?ra=135.1199537&amp;dec=11.77876032&amp;scale=1.584508&amp;width=512&amp;height=512&amp;opt=&amp;query=</a>)  <a href="http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587745540511432980">http://cas.sdss.org/astro/en/tools/explore/obj.asp?id=587745540511432980</a></p>
<p><b>: Re: Give peas a chance!</b>  <b>: lboynton August 19, 2007, 08:22:23 PM</b></p> <p>Just thought I'd toss one into the soup! z=4.10 Get 'em while they're hot! :D</p> <p>587741816777146521  (<a href="http://casjobs.sdss.org/ImgCutoutDR6/getjpeg.aspx?ra=137.68750072&amp;dec=17.7420284&amp;scale=0.09903&amp;width=512&amp;height=512&amp;opt=&amp;query=">http://casjobs.sdss.org/ImgCutoutDR6/getjpeg.aspx?ra=137.68750072&amp;dec=17.7420284&amp;scale=0.09903&amp;width=512&amp;height=512&amp;opt=&amp;query=</a>)</p>

**Figure 4.9**

The users in the above example reference links to SDSS material while contextualizing it. This becomes part of the process of identifying and defining. These users identify a GPG example and attempt to define and categorize that example based on the domain knowledge to which they have access (Z-values). These users build their specific and localized authority but have not yet secured expertise.

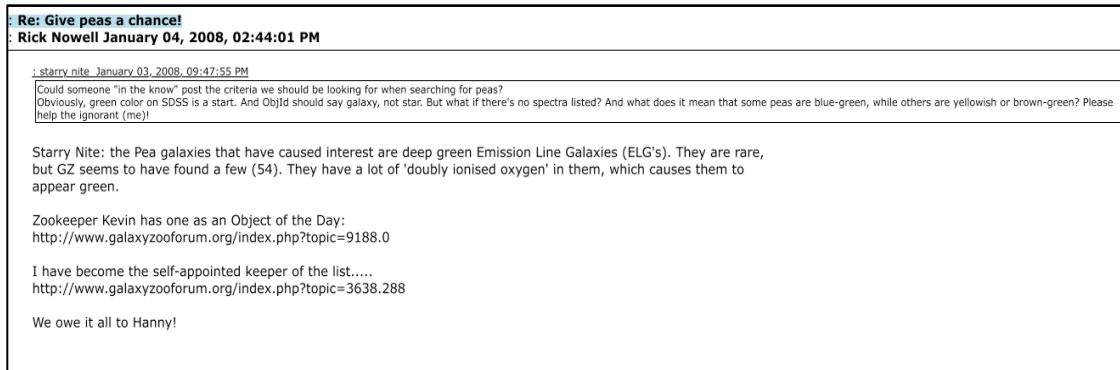
So, where does the transition from authority to expertise happen? This is a much more complicated question than my dissertation can hope to answer; however, based on my analysis, I offer an initial map of the process (see Figure 5.1).



**Figure 5.1**

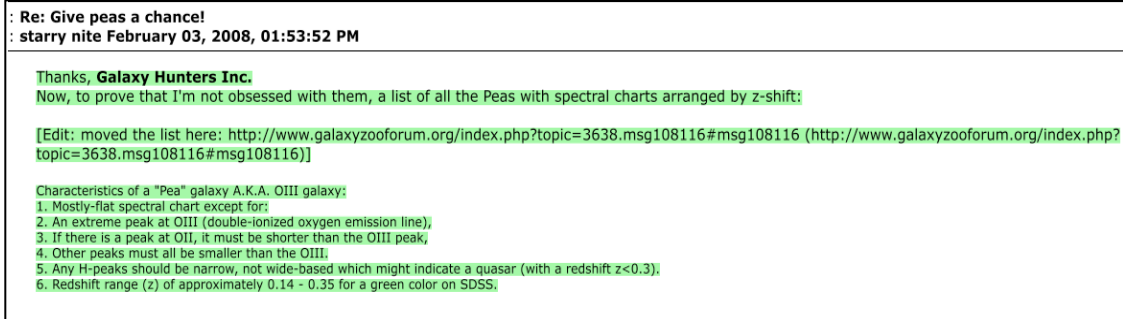
The process illustrated in Figure 5.1 is rudimentary. It needs refinement, but it provides an initial consideration of the process through which one becomes an expert. The first three steps—identify, define, and categorize—are steps of authority-building. As borne out by my analysis, the users within the forum engaged in these steps through the posting of links and the rhetorical moves of hedging and declaring. The remaining two steps—codify and confirm—in Figure 5.1 are steps of expertise. These steps require something beyond knowing about a topic; these steps require the ability to be both critical and reflective. Moreover, the final two steps of the process in Figure 5.1 facilitate the dissemination of a

practice beyond the community in which it was created. For example, as highlighted in Chapter 4, some users began to post in search of criteria to aid them in their search of GPG examples. The criteria that was developed over time demonstrates authority-building in that users are looking for what a GPG is and what it is not.



**Figure 4.23**

In the above example (Figure 4.23), a user responds to a request (“in the know”) for someone to help articulate what qualifies as a GPG. In this post, the user indicates that the galaxies the forum is dedicated to are those galaxies with “deep green Emission Line Galaxies.” This becomes a criterion for evaluating GPG examples. The criteria are further developed in another post. In the move from categorization to criteria, users created something with which they could evaluate GPG examples.



**Figure 4.28**

I used this above example (Figure 4.28) in Chapter 4 to illustrate the codification of criteria by a lay researcher. A discussion forum user articulated a list of values through which other users can evaluate findings. This becomes part of the process of categorizing and codifying.

In my Chapter 4 analysis, I noted numerous examples of the authority-building process. The above examples are only a few that demonstrate the interaction between users and the rhetorical moves employed in the discovery forum. For further examples, please further back to my Chapter 4 analysis.

### ***Rhetorical Analysis in Digital Spaces***

Rhetorical analysis continues to be a useful lens through which to conduct analysis. It is broad enough to accommodate various types of data while being capable of a narrowness that allows specific questions to be answered. The explosion of digital spaces necessitates an examination through rhetoric. The affordances and constraints of digital spaces encourage a type of communication that is beholden to the conventions of the early internet. Despite the rise of certain communication technologies (e.g., virtual reality), the foundation for most digital communication is still based in text, and the best method to explore that text is through rhetorical analysis. The deconstruction of how and in what ways

people communicate in digital spaces is paramount to twenty-first century literacies and discourses.

In the case of the Green Pea Galaxy, users created a localized knowledge community based on specific rhetorical practices that built their authority and contributed to a localized expertise. The rhetorical moves made by users further reinforces the importance of understanding the influence of the internet on language and other communicative practices. As I explored in my Chapter 1 literature review, early work on the role of communication on the internet used rhetorical analysis. But, what role does rhetorical analysis play in future digital communication? Or, on the future internet? Or, within future mobile device-based communities?

It seems that the future of digital communication will continue to be based in textual practices (e.g., Twitter, Facebook, and online learning discussion forums). I suggest this even while knowing that I regularly have video conference meetings with colleagues and students (and even with the very dissertation committee members reading this dissertation). In some ways, the role of rhetoric in everyday communication is more important now than at any point in recent history. I know that is a huge claim to make, but I make that claim because contemporary society is based on information and the communicative practices to convey that information. The speed and reach of digital communication are profound and, at times, beyond measure. When I consider the role of rhetoric in the twenty-first century, I find it harder and harder to distinguish between analog

rhetoric and digital rhetoric. There is barely a distinction between the rhetoric that occurs outside of digital spaces and inside digital spaces.

I muse on the future of rhetorical analysis because my work is based on rhetorical analysis. I do not think that rhetorical analysis will become outdated or without use in contemporary digital communication practices; however, as a researcher who uses rhetorical analysis, I believe that it may be time to stop placing a firm line between communication that happens in analog spaces and communication that happens in digital spaces. The world is far too interconnected to maintain such distinctions.

### ***Future Research***

#### **In Zooniverse**

The projects housed on the Zooniverse system continue to be dynamic and ever-expanding. The Galaxy Zoo project, which housed the GPG discovery forum, continues in various ways with new data uploaded yearly. The amount of research empowered by the Zooniverse system is almost overwhelming. Petabytes and petabytes of data from hundreds of research projects are available to users, and researchers continue to find connections between the work posted on Zooniverse and the work to be found in traditional research environments.

While Zooniverse was originally designed for scientific researchers, humanists are now using Zooniverse for research best explored through crowdsourcing. There are projects on translation and identification. These projects ask users to identify and categorize ancient text within digitized

manuscripts. The potential for translating or transcribing thousands of years' worth of text is remarkable. The role that crowdsourced knowledge projects will play in future research takes on new importance, especially given financial cuts in higher education and research budgets. The ability to post a huge amount of raw data and invite any internet user to aid in research could lead to a deeper understanding of how and in what ways discovery, knowledge, and research are all social enterprises dependent on practices beyond the academy.

In my own research, I find potential in future projects using the Zooniverse system. My interest in crowdsourcing and knowledge projects means that I will likely find use for the Zooniverse system in the future. My concern with the question of authority-building drives me to investigate further how and in what ways nonexperts continue to create and maintain expertise within systems controlled by traditionally-trained experts. There are far too many projects in the Zooniverse system to ignore the potential for answering the big questions of how the internet changes the world and the trust placed in the knowledge practices we interact with every day.

### **In Digital Rhetoric**

Digital rhetoric is in vogue. The world is increasingly digital, and the language used to communicate through digital systems and across the globe calls out for study. Digital rhetoric as an umbrella term encompasses so many subfields and interest areas that scholars will never exhaust potential areas of study. Digital rhetoric now includes the study of language, algorithms, linked data, misinformation, disinformation, propaganda, social media, and dozens of

other interest areas. Still, despite its growth as a phrase, it is only within the last 15 years that scholars have attempted to articulate a unified theory and understanding of digital rhetoric (Eyman; Reeves; Zappen). Other terms continue to be in use, such as computer-mediated communication; rhetoric and technology; electronic rhetoric; and others, though these terms appear less and less frequently in the contemporary literature on the topic.

Research into the rhetorical construction of authority in digital environments will continue. How and in what ways we trust information in digital environments is more critical now than at any time since the advent of the internet. Presently, there are campaigns by various groups encouraging everyday people to distrust the information they come across. internet users across the political spectrum distrust vaccines, health information, and established expertise because they “read it on the internet.”

I anticipate the central concern of digital rhetoric scholars over the next few decades will be how to construct and employ rhetoric in ways to counteract willful ignorance, misinformation, and disinformation. On the internet, everyone is an expert, and, even when they admit they are not, they know someone who is an expert. Furthermore, future research in digital rhetoric will need to address the arbitrary lines established between the analog and the digital. Those terms may no longer be applicable to contemporary internet-based discourse or other discourses that use digital tools, and it will be the role of digital rhetoricians to reconceptualize the role rhetoric plays in both everyday and specialized discourse practices in nonanalog environments.



## **In Higher Education**

Writing instruction is about authority. One of the first things students are taught is how to write with gravitas and how to support their assertions with evidence. The use of evidence builds authority, and the continued use of evidence on a specific topic can lead to expertise. As a writing instructor, I teach my students to respect authority but to question authority when necessary. During the first week of a class, I ask my students, “Why do you trust that I should be teaching this class?” Most of my students scoff at the question, but I ask it to encourage them to think about how I articulate authority and how I exercise my expertise for their benefit.

Students who have never known a non- internet world interact with people from across the globe, and, as the old New Yorker cartoon suggested, they can never know who they are talking to on the internet. If students can learn how to distinguish between the rhetorical moves that build authority on the internet, they may be able to identify when and how information they encounter is legitimate. The classroom experience of students in both face-to-face and online environments is based on a fundamental trust between student and instructor. In studying how authority is constructed in digital environments and the process of expertise, students, and instructors both will be better equipped to address the dynamic and sometimes chaotic nature of twenty-first century discourse.

Finally, this dissertation is about a very specific question and a very specific case; however, the question of authority, expertise, and digital

environments is important to other areas of rhetoric and writing studies writ large. The analysis and discussion in this dissertation may benefit scholars in technical communication and organizational communication, as well as traditional English Studies fields. The concepts explored in this dissertation will find value in any scholarship concerned with how humans use digital environments to construct meaning and persuade others to trust a message.

### ***Chapter Summary***

The case of the Green Pea Galaxy discovery prompts important insight into how users create, maintain, and use authority in the process of attaining localized expertise. The process of attaining expertise is not always a conscious process, but it is one that is deeply affected by rhetorical moves and acts. The means through which users identify, categorize, codify, and confirm knowledge in digital environments provides an opportunity to researchers to better understand how and in what ways humans are led to trust the information they receive. As we progress, this understanding will be critical to assessing misinformation, disinformation, and propaganda, or any type of information that depends on the authority and expertise of a rhetorician.

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