

How odd is odd? Studying Astronomers

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Abstract

Cultural astronomy remains broadly defined so as to include the history of astronomy, sociology of astronomy, and anthropology of astronomy. Since 2006, I have embarked on a series of research projects focused on astronomers in the United States and South Africa. My projects have included surveys, ethnography, oral history, and making films (Holbrook 2012; Holbrook submitted; Murillo et al. 2012; Tapia 2009). Doing research on this scientific community has not been without challenges methodologically and personally. Methodologically, data collection was an issue. In one of the projects our primary means of data collection are ethnographic oral history interviews lasting from one to three hours with individual astronomers. Originally students working on the project had to adjust to astronomy culture and to interviewing people much more senior. Also, they needed a handbook of astronomy jargon to understand what the astronomers were talking about. Even as a cultural insider, I was not up to date on all the new astronomy satellites and new telescope projects; so I too had to learn and relearn the intellectual trends in astronomy over the last dozen years. However, as a cultural insider I had more success at establishing rapport and at pushing people beyond their comfort zone to provide more honest answers. I will discuss the advantages and disadvantages of working within one's own culture and how in some ways our sample is biased. Every project begins with hypotheses that are to be tested, however, what I find most delightful is discovering something completely unexpected. Thus, a rogue's gallery of my research projects with the associated unusual finding will be presented.

POVZETEK

Po najširši definiciji kulturna astronomija vsebuje zgodovino astronomije, sociologijo astronomije in antropologijo astronomije. V letu 2006 sem začela z nizom raziskovalnih projektov, v katerih proučujem astronome Združenih držav Amerike in Južnoafriške republike. Delo je obsegalo raziskave, etnografijo, ustno izročilo in izdelavo filmov (Holbrook 2012; Holbrook oddano; Murillo et al. 2012; Tapia 2009). Proučevanje te znanstvene srenje je bilo polno metodoloških, pa tudi osebnih izzivov. Metodološko je bil največji izziv zbiranje podatkov. V enem od projektov smo podatke zbirali z intervjuji, anketiranje vsakega astronoma pa je trajalo od ene do treh ur. Študentje, ki so izvajali ankete, so se morali priučiti astronomske tematike – potrebovali so celo slovar astronomskega žargona, da so lahko razumeli povedano – in se prilagoditi dejstvu, da so izpraševali precej

starejše osebe. Čeprav sem insajderka na tem področju, tudi sama nisem bila povsem na tekočem z vsemi novimi astronomskimi sateliti in novimi teleskopi; zato sem se morala poučiti ali obnoviti znanje o astronomskih intelektualnih trendih v zadnjih letih. Po drugi strani pa mi je insajderstvo omogočilo več uspeha pri navezovanju stikov ter pri potiskanju ljudi prek okvirov njihove cone udobja, kar je dalo bolj pristne odgovore. V članku obravnavam prednosti in slabosti pri delu z lastno kulturo in opozarjam, da je naš vzorec v nekaterih pogledih pristranski. Vsak projekt se začne s hipotezami, ki jih želimo preveriti, toda moje največje veselje predstavljajo nepričakovana odkritja. Članek prikazuje zbirko mojih raziskovalnih projektov, skupaj z njihovimi nenavadnimi izsledki.

Why study astronomers?

What are some good reasons to study astronomers? To learn what the history books do not tell you! Humans are complex bundles of emotions, thoughts, experiences, and actions; they are not stationary and often contradict themselves. When portraying scientists in various non-fiction forms such as in documentaries, in history books, etc., they become two-dimensional and their complexity is lost. Also of importance, astronomers and other physical scientists primarily operate in a reductionist mode. This means that they usually simplify information to make it more manageable and focus mainly on the bottom-line. In terms of scientific thought, process, practice, etc., again the true complexity is lost in the retelling. Though there is a very attractive elegance to simplicity and bottom-line thinking; the real world, the real scientific world, is messy, complex, difficult, non-linear, etc. There is the issue of 'setting the record straight' that is collecting multiple narratives of the same events in order to unravel a sequence of events and behind the scenes actors. There is also the opportunity to witness events first hand when studying astronomers, if a researcher is present during significant decisions, discoveries, etc.

There are benefits to studying astronomers including demystifying the lives of astronomers and what they do in order to attract more students. There is the opportunity to show the actual application of the scientific method rather than the imagined one and to capture what is often overlooked in historical accounts such as the role of funding, children and spouses, professional networks, research teams, career decision-making, and chance.

My personal decision to study astronomers was motivated in two parts. The first was that most of my students wanted to study gender issues in astronomy among astronomers rather than indigenous astronomy. I supported these students, however, found that the data they collected was of limited value in part because I knew their informants and knew that what was collected was a sanitized version of events if not an outright lie. This was less the case if they focused on astronomy students rather than PhD astronomers, that is, their data was better the closer the informants were to their own age. The second was that I was asked to join a collaboration studying astronomers by Sharon Traweek at UCLA (Reid & Traweek 2000; Traweek 1988). She needed a cultural insider who was also a social scientist, so I joined as her co-investigator in 2009.

'Studying Up' & Studying Across: Data Collection

'All participant observers confront their personal limitations and the limitations imposed on them by the culture they study (Bernard 2011: 281).'

The idea that the data collected is in some part dependent upon who is doing the collecting is not new in the social sciences (Bernard 2011: Chapter 12; Mead 1986). As mentioned in the last section, my students collected more accurate data from people closer to their own age, which is a familiar phenomenon in the social sciences (see Corbin Dwyer et al. 2009). In addition to age differences there are physical differences that may influence the data as well as differences in economic class, social power, and knowledge. The roots of anthropology embraced the study of indigenous people by Europeans which is embedded in a power structure such that Europeans assumed that they were wealthier, more moral, smarter, wiser, and so on. They chose to 'study down', that is to study people and cultures that they believed were not superior to them. This was especially true in terms of scientific knowledge; the anthropologists usually knew more about scientific findings especially medicine than the populations that they studied. In financial terms, they tended to study poorer and non-urban communities.

When anthropologists decided to study physical scientists, they had to study people who did not fit that traditional power structure. Physical scientists know more about science and often get paid much more than anthropologists. Laura Nadar used the term 'studying up' to capture this new anthropological realm (Nadar 1972). Anthropologists have also made the move from studying 'exotic others' to studying their own culture, that is anthropologists of a certain ethnicity will in some cases study people of their own ethnicity. For example, an anthropologist who is from New York City and Jewish may chose to study Jewish people in New York City. This is captured in the 'insider-outsider' debates in the social sciences. The debate focuses on what are the benefits and problems with being a cultural insider or a cultural outsider for social science research (Fay 1996; Naples 1996; Merriam et al. 2001; Corbin Dwyer et al. 2009).

Dependent upon the project, I occupied all possible positions in the power structure between anthropologist and informant: I sometimes have to 'study up' when I was interviewing observatory directors, studying across when I was interviewing other astronomers, and studying down when I was interviewing astronomy students. Likewise, I was both a cultural insider having been trained as an astronomer, and a cultural outsider having been trained as a social scientist.

As a cultural insider, I found that I knew where to start with most informants and knew how to probe sensitive issues in a way that I did not find with my team members. Thus, my insider status, I saw as an advantage for the most part: I knew the language of astronomy and how to frame questions, I knew how to act like an astronomer, and I had a lot of insider knowledge. On the other hand, I would get angry and not be able to show it when I was collecting data when people would speak in ideals and hypotheticals as if they were solid facts. Also, there was the emotional toll of hearing about horrible things and keeping secrets. I would also get data fatigue which was from simply needing to process the huge amount of information that I was gathering.

Overview of projects with their major hypotheses

Three of my projects include studying astronomers. The first is a large scale survey project titled ‘The Sky in Our Lives.’ The primary hypothesis of the project is that as with ancient people, contemporary people have a relationship with the night sky. However, we do not know the details of that relationship. The survey consists of five sections: Demographics, The Sky in Our Lives Long Answers, Noctcaelador Index, Astrology Survey, Attitudes towards Astronomy. In printed form, the Survey is over ten-pages, however it can be found online through search terms ‘Sky in Our Lives Beta’ or <https://t.co/RbjY7den>). The Survey is not specific to astronomers, but because I circulate primarily within the astronomy community many astronomers have done the survey since 2006.

Population	Number of People
Male	203
Female	136
Total People	339
Astronomy Connection	Number of People
Astronomy Grad Student	31
Astronomer (PhD)	37
Amateur Astronomer	32

‘Semistructured interviewing works very well in projects where you are dealing with high-level bureaucrats and elite members of a community— people who are accustomed to efficient use of their time. It demonstrates that you are fully in control of what you want from an interview but leaves both you and your respondent to follow new leads. It shows that you are prepared and competent but that you are not trying to exercise excessive control (Bernard 2011: 158).’

The second project focuses on South Africa’s national program to transition more students into astrophysics and space science doctoral programs. They were having problems retaining specific populations of students leading to my hypothesis: The lack of the success of certain groups of students is due to that aspect of astronomy culture which privileges those ‘closest’ to EuroAmerican culture and insists upon all students acculturating to this ideal. Two months of fieldwork including classroom teaching was completed in 2010 with two additional visits in 2011. The primary means of data collection was semi-structured interviews that were digitally recorded. I had access to 73 digitally recorded interviews which were transcribed for analysis.

The third project is focused on American astronomers and their use of large-scale databases with a particular focus on women and underrepresented groups. The hy-

pothesis is that women and minority astronomers build their professional networks and navigate their careers differently from the majority. As with the South African project, we use semi-structured interviews as our primary means of data collection. This project is a team project, whereas with the South African project I worked alone. As a team we have attended conferences where we observe astronomers and presented our research to astronomers. Our team has collected 127 digitally recorded interviews with astronomers.

Unusual findings

The Sky in Our Lives Survey taken by 37 PhD astronomers and several more astronomy PhD students showed that many astronomers claim a religious tradition. The popular myth is that physical scientists are atheists is reinforced by the popular works of authors such as Richard Dawkins (Dawkins 2006), Carl Sagan (Sagan 1995), and others (Nanda 2012). However, in this very small population that I sampled atheists and agnostics were not the majority among the astronomers or the PhD Students.

Astronomers' Religions	40 Total
Christian	7
Christian	7
Atheist	6
None	4
Agnostic	4
Jewish	3
Blank	2
Buddhist	1
Traditional	2
Protestant	1
Eclectic	1
Hindu	7
Catholic	7
Unitarian	1

The question asked in the survey was ‘My spiritual/religious tradition is (Buddhist, etc.)’ with a blank space provided to write their answer. Table shows the responses which were free form and it can be seen that most astronomers were some Christian denomination. Three claimed at least two religions bringing the list to 40 rather than 37 responses. Using the same table but putting in the data for the graduate students the results shift only slightly but it remains true that most of them are not Atheist or Agnostic.

Astronomy Grad Students	28
Christian	14
Atheist	3
None	6
Agnostic	0
Jewish	0
Blank	2
Buddhist	0
Traditional	2
Protestant	0
Eclectic	0
Hindu	1
Catholic	0
Unitarian	0

This result is found to be very disturbing for those astronomers who are Atheists and never fails to get a discussion going about the topic or critique of my data collection method. Both are ways of dealing with a result that makes no logical sense to certain astronomers.

Another unusual finding is from my study of the national astronomy program in South Africa. South African astronomy is dominated by Europeans, Americans, and a handful of others, very few are actually South African. By very few, the number is on the order of a dozen or so. Of these only three PhD astronomers are Black South Africans, the remainder are White South African. Thus, when I began studying the South African astronomy culture, I found that it was just EuroAmerican astronomy culture transported to South Africa. Thus, the acculturation of the South African students and the transculturation of the instructors and administrators was important for the success of the program.

Also, from the South Africa study and the USA study of astronomers, I found that the astronomers performed Whiteness (Steyn 2004). In the USA, when confronted with the superior performance of Asian and Asian American students, the White astronomers would say ‘They are very smart, but not creative.’ In South Africa, when the White South African students were confronted with the superior performance of the foreign African students, they would say ‘They are brilliant at maths and physics, but we are better with computers.’ Both phrases were ways to recoup their notions of White intellectual superiority in the face of the challenge presented by non-Whites (see Ditomaso et al. 2007).

In my study of USA astronomers, there was a narrative that I heard from a few women astronomers that were deliberate attempts to explain away the bad behaviors of their male colleagues and mentors. Thus, the women would know that what had happened or what they had witnessed was bad and could have a negative impact on the women involved, but they would then verbally ‘spin’ the situation so that it did not sound as bad or in fact was a positive thing. This reframing of events so that they appear to be more positive is called ‘positive reappraisal’ and in psychology is a known coping mechanism (for example see Shiota & Levenson 2012). ‘Stereotype threat’ is another psychology term that captures the negative effect that group stereotypes can have on individual performance (Steele and Aronson 1995). Thus, if a young woman is reminded of the stereotype that women are not good at mathematics before a math test, she will do worse. Surprisingly, women who practice positive reappraisal as a coping mechanism are more resilient against stereotype threat. Thus, positive reappraisal, which in some sense is deluding oneself, can be seen as a positive for surviving a hostile environment.

Conclusions

Studying astronomers using participant observation and semi-structured interviews is challenging and time-consuming. It is slow research. In addition, it is expensive research because it is so time-consuming. In contrast, it is fairly straightforward to collect survey data, but ultimately further interviews and discussion is needed to ensure that the interpretation of the data is correct. Studying astronomers though odd can be rewarding in that much can be learned about success strategies and the culture which can translate to help future students of astronomy. Finally, such research can reveal surprises and noteworthy unusual findings.

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