



Women in the Lab, Men in the Field? Correlations between Gender and Research Topics at Three Major Archaeology Conferences

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ABSTRACT

Rising interest in gender equality in society has resulted in greater scrutiny of gender inequality in academic communities. Analysis of authorship of peer-reviewed publications shows that archaeology, like other academic fields, has long been dominated by men. We ask if gender disproportionality is evident in the topics presented by archaeologists at major conferences, particularly the Society of American Archaeology (SAA), the European Association of Archaeologists (EAA), and the Computer Applications and Quantitative Methods in Archaeology (CAA) meetings. Does participants' gender correlate with the topics of their presentations? We analyzed presenters' names in published programs to infer gender. We used machine learning to identify topics from presentation titles. We found distinctive topics that are strongly associated with women, such as cultural heritage, GIS, and isotope analyses. Awareness of these correlations between research topics and gender is important to ensure equitable participation in archaeology and unbiased access to training opportunities for students.

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Introduction

Issues of gender inequality have long existed in science, from the underrepresentation of women and minority genders in school textbooks to academic publications (Hamilton et al. 2006; Tushingham, Fulkerson, and Hill 2017). Women are often underrepresented for several reasons, including stereotyping that unfairly underestimates individuals' abilities and often leads to a lack of support for women in academic fields (Xu 2008). Although studies of occupational segregation by gender in research professions in Europe during 2002–2006 show that the gender gap in academia has been slowly shrinking in recent years, there remain substantial differences. These result in the underrepresentation of women in many fields and career stages, as well as disadvantages such as lower salaries and less access to positions that are considered more prestigious (Caprile et al. 2012). Even research into gender bias suffers from existing biases: Cislak, Formanowicz, and Saguy (2018) found that research reported in articles on gender bias and race bias are less often supported by funding and published in journals with lower prestige than articles on comparable instances of social discrimination. This intersection between gender and prestige has also been observed in archaeology, with men showing significantly higher mean measures of journal prestige in their publications than women (Beck, Gjesfjeld, and Chrisomalis 2021). Among archaeologists, investigation of women and gender in the past is an active topic area with numerous volumes and interesting case studies (Tomášková 2011). However, there are at least two camps of gender researchers: those that explore gender in the absence of feminist theory and those that engage with feminist theory, actively exploring its practical implications for questioning categories and inequalities in contemporary communities of practice (Kretzler and Marwick 2015).

In this paper, we explore the relationship between gender and archaeological research topics in conference presentations to determine if women and men tend to focus more on certain topics more than others. We used a computational method to identify topics from the titles of presentations delivered at meetings of the Society of American Archaeology (SAA 2018), the European Association of Archaeologists (EAA 2018), and the Computer Applications and Quantitative Methods in Archaeology (CAA 2018). We analyzed the covariance of topics and genders of presenters to explore how gender ratios vary between these conferences and by topics. We found that at all three conferences there are distinctive topics that are strongly associated with women, such as managing cultural heritage, GIS, and isotope analyses.

Background

Gender bias and imbalance have been core concerns in discussions of the disciplinary sociopolitics of archaeology for many decades (Gero 1983). For example, Gero (1994) noted that women in archaeology were most active in laboratory-centered research activities rather than excavation/fieldwork related activities. Sinclair (2016) explored this observation in a quantitative bibliometric analysis of 268,000 authors of archaeological articles. He found that topic categories with relatively high proportions of women include archaeological chemistry (especially lipids analysis) with 40% women authors, isotope analysis with 30% women authors, and dating (especially thermoluminescence and magnetism) with 30% women authors. Sinclair proposed that his results generally support Gero's (1994) claim that women in archaeology have been most active in laboratory-based activities rather than excavation/fieldwork-related activities.

These observations about gendered division of work in archaeology have been extended into explorations of the

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gender imbalances in publication practices in archaeology, where men greatly outnumber women, especially as first authors in peer-reviewed journal articles. Bardolph (2014) conducted one of the first studies aimed at investigating this imbalance in publication practices, examining 1601 articles published between 1990 and 2013 in five high-visibility archaeology journals. She found the proportions of women to men authors ranged from 0.32–0.73, with three of the five journals having a proportion of < 0.5.

In a more extensive follow-up study, Bardolph (2018) examined data from 2007–2017 on membership in the Society of California Archaeology (SCA) conference and the lead authors of *Journal of California and Great Basin Anthropology* (JCGBA) and *California Archaeology* (CA). Bardolph (2018) noted that women's conference presentation rates are consistent with their membership rates in SCA, and that it was not until 2017 when women's participation rates finally exceeded men's. Although women are more actively participating in SCA, this is not the case for lead-authorship in JCGBA and CA (Bardolph 2018). Throughout the period studied, lead-authorship of JCGBA articles was highly skewed towards men, with only 34% women. A greater difference between men and women lead-authorship can be seen in CA: in 2009, there were no women lead authors, and overall, only 23% of papers published in CA had women as lead authors (Bardolph 2018).

Additional investigation on gender ratios among the membership of the Society for California Archaeology was reported by Tushingham, Fulkerson, and Hill (2017), who reported that although an increased number of women maintained their society membership during 1967–2016, they remained underrepresented in peer-reviewed journals. Tushingham, Fulkerson, and Hill (2017) examined authorship gender trends in 1599 papers in three journals: *Journal of California and Great Basin Anthropology*/*Journal of California Archaeology* (JCGBA/JCA), *California Archaeology* (CA), and a non-peer-reviewed publication, *Proceedings of the Society for California Archaeology* (PSCA). Of 2617 authors, 844 (32.3%) were women, 1762 (67.3%) were men, and 11 (0.4%) were gender unknown/ambiguous (Tushingham, Fulkerson, and Hill 2017). They found significant increases in the proportion of female lead authors over time in JCGBA/JCA and PSCA but not in CA, likely because this journal is relatively young and has published relatively few papers so far (Tushingham, Fulkerson, and Hill 2017).

Expanding on their 2017 study, Fulkerson and Tushingham (2019) collected data on author gender and occupational affiliation in four peer-reviewed journals (*American Antiquity* [AQ], *Advances in Archaeological Practice* [AAP], *Journal of California and Great Basin Anthropology* [JCGBA], and *California Archaeology* [CA]) and two non-peer-reviewed venues (the *SAA Archaeological Record* [SAA Record] and the *SCA Proceedings*). Among the 5010 authors of 2445 articles in their sample, 27.1% of first/single authors of peer-reviewed journal articles were women, and 72.9% were men. Interestingly, the gender gap is less pronounced in the non-peer-reviewed venues, with women accounting for 40.8% of lead authors in 517 articles.

Rodríguez-Álvarez and Lozano (2018) similarly studied the gender balance of 309 authors of 299 publications appearing during 1978–2016, where the authors were members of the Atapuerca Project, a large archaeo-paleontological project in Burgos, Spain. They manually defined the

gender of each author and found only 13 articles were exclusively authored by women, 34.8% of papers had women as first authors, and overall, 35.9% of all authors were women (Rodríguez-Álvarez and Lozano 2018). Over time, they observed a trend of increasing women's authorship in the numbers of papers led by women as the first author and increases in the ratio of female to male authors in group-authored papers.

Heath-Stout (2020a) found a similar gender imbalance in her analysis of the first authors of 1104 articles published in the *Journal of Field Archaeology* during 1974–2018, with 72% men. She further investigated the possibility that the gender gap in authorship was due to sexism in the peer-review process. Out of 830 instances of peer-review where both the reviewer's gender and the first author's gender could be determined (for example, from a public profile online), neither the first author's gender, the reviewer's gender, nor the combination of the two had a significant effect on the reviewer's recommendation, suggesting that sexism had a minimal contribution.

In a follow-up study, Heath-Stout (2020b) made a more robust determination of author identity by conducting a survey that directly asked archaeologists for their self-identifications of gender, race/ethnicity, and sexual orientation. In her analysis of author genders in 21 archaeology journals over a 10-year period (2007–2016), Heath-Stout found that although an overrepresentation of straight, white, cisgender men is an enduring pattern, authorship is slowly approaching gender parity, with many journals publishing more articles by women over time. Heath-Stout (2020b) cautions that this trend towards gender parity does not entirely signal an increase in the diversity of the community, with her data showing that the discipline remains dominated by white, straight, and cisgender individuals.

These studies summarized above have established a comprehensive baseline for gender disparity in archaeological knowledge production. We extend this work in two novel ways. First, by shifting the focus from authorship of journal articles to authorship conference presentations, a group that has not been well represented in previous studies. Although we did not specifically collect data on this, our experience as participants in numerous conferences is that conference presenters include many people who may never publish a journal article, such as undergraduates and archaeologists working in non-academic contexts. Second, we return to Gero's observation that gender disparities in archaeology follow a labwork-fieldwork division, and we investigate this quantitatively using topic modeling to compute how author gender correlates with the archaeological topics presented at conferences. In this paper, we advance the study of gender and authorship in archaeology by specifically focusing on the gender imbalance that occurs in the topics that authors present in major archaeological conferences.

Methods

To collect data for our study, we requested that conference organizers send us spreadsheet files of the publicly available program information for three major archaeology meetings held in 2018: the Society of American Archaeology (SAA), the European Association of Archaeologists (EAA), and the Computer Applications and Quantitative Methods in Archaeology (CAA).

We estimated the gender of the first-named speaker for each presentation using the R programming language and the “gender” package (Blevins and Mullen 2015; Lincoln *n.d.*; Mihaljević et al. 2019). We inferred the gender of each speaker by comparing names with baby name data from the US Social Security Administration (SSA) and calculating the overall probability that a given name was male or female (Mihaljević et al. 2019). If more than half of the people with a particular name are female in the SSA data, we recorded presenters with that name as female. We followed the same procedure for male names. For example, in the SSA dataset, the name “Lynne” returns 0.006 as a proportion of individuals with this name who are recorded as male and 0.994 as the proportion of female; thus, we inferred that people in our conference data who are called Lynne are women.

This method of inferring gender has the advantage of rapidly determining gender for a large number of names in a transparent and reproducible way, but it also has some substantial limitations that are important to be upfront about. We are only able to infer binary male/female genders and assign the first names to these two categories. This has the unfortunate result of excluding or misidentifying other genders from the results, excluding them from our analysis. We considered it impractical and invasive to write to each first-named presenter to request their gender information. A further limitation of our approach is that it sometimes fails to classify non-English names at all, as the SSA data consists mostly of English names. This means that people with non-English names are underrepresented in our results. Finally, we did not attempt to correct for shifts in the gendering of names over time: for example, the name “Hadley” was previously popular as a woman’s name but is more recently popular as a man’s name. Implementing this correction would require data on the age of authors, which was not available to us. It is important to note that the inferences presented here are not self-identified by the presenters but are computed probabilistically. Better-quality and more representative data would result if presenters self-identified their gender to conference organizers, but currently, these data are not available. We encourage conference organizers to collect gender data directly from participants to improve the representation of minority genders in future studies. Our hope is that this work, despite (or perhaps because of) its many limitations and biases, will stimulate the collection of more reliable, justifiable, and useful data by conference organizers.

We identified the topics in each presentation by generating a structural topic model (STM) for all the presentations in each of the three conferences. Topic modeling is a machine learning method that is widely used to automatically find related groups of words that resemble traditional themes or topics in large collections of documents (Chang et al. 2009). Topic models are unsupervised methods because they infer rather than assume the content of the topics in a collection of documents, and they have been used across a variety of fields. Our approach uses latent Dirichlet allocation (LDA) to allow every word to be present in every topic but with different weightings, such that the most heavily weighted 5–10 words of a topic often capture the essence of the topic as a coherent and familiar concept. Because every word is present in all topics, it is normal to see the same word in multiple topics. To prepare our data for topic modeling, we excluded words that are very common in English generally (stopwords), and in archaeology

for our specific case, and so have little semantic value. We also applied a stemming procedure to words in our documents as part of our pre-processing to reduce repetition and simplify interpretation of the output (e.g., “technological,” “technologies,” and “technology” all share the common stem of “technolog”).

When first generating topic models, we must first determine the number of topics that the method will identify in our texts. We used the method of Mimno and Lee (2014), implemented in the “stm” package, to find the optimum number of topics. It is important to note that because this method is probabilistic, it will not always result in the same number of suggested topics each time it is run. Once the optimum number of topics is determined, each document (i.e., conference presentation title) is assigned a distribution of topics with different weights. We can think of each presentation title as a mixture of topics, and our analysis aims to discover, first, what those topics are for the entire set of presentation titles and, second, the proportions of each topic in each presentation title.

Our structural topic model allows us to include other document-level metadata to analyze covariance between topics and document-level variables of interest (Roberts et al. 2019). Covariates of interest can be included in the prior distributions for document-topic proportions and topic-word distributions using a standard regression model (Roberts et al. 2014). In our case, we computed the relationship between the inferred gender of the first-named presenter for each presentation and the distribution of topics in that person’s presentation. After we observed the topics for each presentation, we then generated a regression where the topic is the outcome variable and gender is the explanatory variable. This regression gives us insights into whether there are non-random relationships between the inferred genders of archaeologists and the topics of their presentations. Our data visualizations represent the estimated marginal effect (the x-axis values) of gender on each topic (distributed on the y-axis). Our visualizations show point estimates and 95% confidence intervals for each topic. We interpret a statistically significant gender effect on the distribution of a topic when the 95% confidence interval does not include zero. We use triangular points and red coloring to indicate topics with significant effects and black circular points for topics with non-significant effects. Our plots include summaries of each topic represented by the highest-weighted 12 stemmed words for each topic.

Reproducibility and Open Source Materials

The entire R code (R Core Team 2019) used for all the analysis and visualizations contained in this paper is included in the Supplementary Online Materials at <https://doi.org/10.17605/OSF.IO/ZFB36> to enable re-use of materials and improve reproducibility and transparency (Marwick 2017). Also in this version-controlled compendium (Marwick, Boettiger, and Mullen 2018) are the raw data for our study, which are equivalent to the publicly available data in the conference programs but are organized here in a tabular structure convenient for computational analysis. All the figures, tables, and statistical test results presented here can be independently reproduced with the code and data in this repository. The code is released under the MIT license, the data as CC-0, and figures as CC-BY, to enable maximum re-use.

Results

Overall, we see similar women-to-men ratios for the SAA (1.1) and EAA (1.2), but the ratio is much lower for the CAA (0.6), which also has a much smaller number of papers relative to the other two conferences (Figure 1). Even before we investigate the gender preferences for specific topics within each conference, we already have a hint that computational topics may be less preferred by women than by men.

In the SAA data, we found a total of 2930 presentations. Of these, we could identify the first-named authors of 2608 (89%) presentations as either men ($n = 1246$) or women ($n = 1362$). In the SAA presentations, we identified the optimum number of topics as 35, with 17 of these showing non-random covariance with the gender of the first-named presenter (Figure 2). Eight of these topics were associated with men, and nine topics were associated with women. Topics associated more with women include bioarchaeology, cemeteries, burials, shells, and ceramics. Topics associated more with men include survey and landscape archaeology, geoarchaeology, rituals, and regional studies. One of the main differences that we can see between the topics of the genders are the geographical locations that the presenters are interested in. Women are more likely to work in locations such as Mesoamerica, Arizona, and national parks, while men are more likely to present on topics about the Great Lakes and Honduras.

For the EAA data, we have 2928 presentations and 2237 (76%) where the first author could be classified as either a man ($n = 1016$) or a woman ($n = 1221$). For EAA, we generated a total of 37 topics, with 16 of these showing non-random covariance with the gender of the first-named presenter (Figure 3). Seven of these topics were associated with men, and nine topics were associated with women. Although topics significantly associated with men and women both include the word “Mediterranean,” women seem to be focusing more on the western Mediterranean while men seem to be focusing on the northern Mediterranean. Topics associated more with women include burials, graves, museums, animals, diet, and ritual. Topics associated more with men include geoarchaeology, architecture, and towns.

For the CAA meeting, we have 358 presentations, and 318 (89%) first-named authors could be classified as either men ($n = 194$) or women ($n = 124$). For CAA, we generated a total of 27 topics, with six of these showing non-random covariance with the gender of the first-named presenter (Figure 4). Three topics were associated with men (excavation, landscapes, and aerial imaging), and three topics were associated with women. Topics associated more with women include archives, GIS, geophysics, collaboration, and teaching. Topics associated more with men include environmental and landscape archaeology.

Discussion

Our results show significant correlations between the gender of the first-named presenter and the topics in their conference presentation in all three conferences. Although each of the three meetings have distinctive sets of topics, we can identify some common themes in the topics that correlate with gender. We found that topics strongly associated with women at all three conferences relate to managing cultural

heritage, GIS, and isotope analyses. These contrasts and similarities reveal some of the choices that presenters make when deciding where to share their work. The SAA and EAA are defined mostly by the geographic region of their community: the Americas and Europe. They have more participants, and our model identified a higher number of topics in these two, compared to CAA. CAA, with its focus on computer applications and quantitative methods, has a much smaller community and a smaller number of topics. So, we might expect less in common between CAA and the two bigger conferences. At both the SAA and EAA, we see that topics about burials, cemeteries, bodies, and graves are strongly associated with women. For the SAA and CAA, the women-associated topics common to these two conferences include learning and practice. For the EAA and CAA, the common topics associated with women presenters are self-referential: women and gender. The absence of bioarchaeology and topics about human remains at CAA suggest that archaeologists working on those topics either do not recognize this conference as a meaningful place to present that work and/or there are some unrealized opportunities to apply computational and quantitative methods in bioarchaeological research.

Topics that are strongly associated with men at all three conferences include geoarchaeology and geophysics. Topics associated with men at the SAA and CAA include built-location-based research, indicated by keywords such as house/town/site/fort. At both SAA and CAA, we see landscape as a shared topic that is strongly associated with men. For the EAA and CAA, there is little overlap in topics strongly associated with men. The geophysics topic is notable here because it is also in the CAA topic that is most strongly associated with women. It is strongly associated with men at the SAA and EAA but also strongly associated with women at the CAA. This is one of our most striking findings, that a topic is not immutably bound to either men or women but that topics can shift in prominence among genders depending on the context. This finding is important for understanding the relationship between genders, topics, and communities. These relationships are flexible and contingent, such that a topic-gender association is specific to a particular community (i.e., conference), arguing against topic-gender generalizations that attempt to transcend communities of practice.

Our results are not entirely consistent with the labwork-fieldwork division noted by previous work (Chase 2021; Claassen 1994; Gero 1994). On one hand, our finding of women presenters being more associated with presentations on heritage, learning and practice, and women and gender does support Gero’s identification of distinctly feminine-coded work in archaeology. On the other hand, the association of women with topics about burials, cemeteries, bodies, and graves, GIS, and isotope analyses can imply women’s involvement in field-based projects. In this respect, our results are more consistent with the findings of Heath-Stout and Jalbert (2023) from their analysis of 4893 successful NSF grant applications during 1955–2021. They found that women led 24% of exclusively-field projects and 31% of exclusively-lab projects; the difference was not statistically significant. They propose that the simple binary gendering of the field/lab divide is either not as prominent as it once was or may no longer exist, and a more complex model of the gendered divisions of labor is required that intersects with

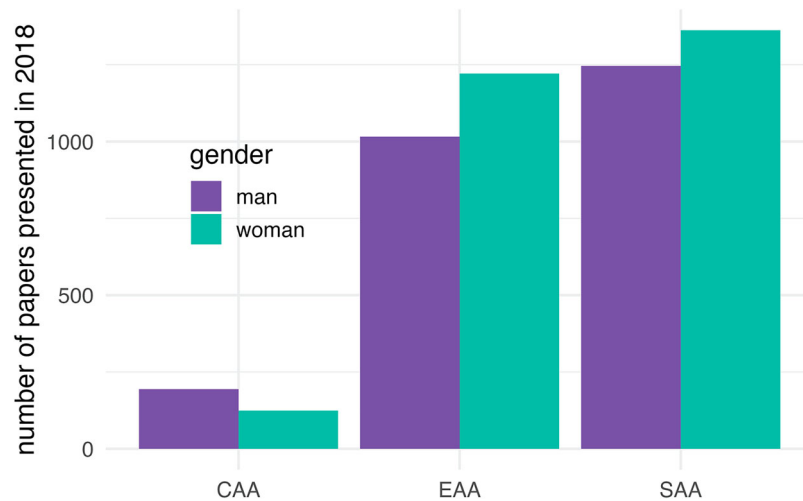


Figure 1. Frequencies of papers at each of the three conferences by gender.

other demographic factors and the regions where archaeologists work.

To contextualize our findings beyond archaeology, we note that related work on gender differences and research topics has noted major differences in the proportions of men and women across many academic-related interests. One early and widely discussed theory, especially in psychology, to explain this is the theory of people-thing interest dimensions, which proposes that men have a stronger interest in things and their mechanisms, while women have a stronger interest in people and their feelings (Miner 1922; Su, Rounds, and Armstrong 2009). Stoet and Geary (2022) used this theory in their investigation of gender differences in 473,260 adolescents' aspirations to work in things-oriented (e.g., mechanic), people-oriented (e.g., nurse), and STEM (e.g., mathematician) careers across 80 countries and economic regions using data from the 2018 Programme for International Student Assessment (PISA). They found that boys generally aspired to a things-oriented or STEM occupation and girls to a people-oriented occupation. Some of our results are consistent with this people-thing model: for example, "people" topics such as burials, cemeteries, bodies, graves, collaboration, and teaching are associated more with women than men. The incomplete fit of the people-thing model to the archaeological research community might be explained by the distinctive nature of archaeology as a discipline, where archaeologists are generally social scientists (people-oriented, through their study of past humans) but use material culture to study people (thing-oriented, though their analysis of physical remains of human behaviors and relationships).

Recent work by Thelwall and colleagues (2019) shows that gender differences in choice of research topics cannot be fully explained by the people-thing theory from psychology. Thelwall and colleagues looked at 508,283 journal articles, classified the articles into research areas, and determined the authors' genders by matching names with the 1990 US census data. Instead of a people-thing contrast, they find that women are more likely to use exploratory and qualitative methods rather than quantitative methods and men show a stronger interest in male-in-abstraction and power/control fields. In our data, we similarly see an interest from men in quantitative methods. However, our results do not so clearly divide the interests of the two genders: for example, women

are more prominent in GIS and isotope analyses, which are also highly quantitative areas.

The work of Ostapenko and colleagues (2018) on surgeons provides some insights into the process by which archaeologists may come to the topics that they present at conferences. Ostapenko and colleagues (2018) identified common topics in the personal statements of aspiring surgeons that were specific to men and women authors. Women tended to discuss surgery as working as a team, while men focused on their specific individual clinical experiences. Ostapenko and colleagues (2018) propose that the differences between male and female statements may come from actual motivating factors for career goals and aspirations, or they may reflect differences in beliefs about what makes a successful personal statement. They could not evaluate which explanation was most important, but a key observation is that authors of the personal statements may not deliberately choose the themes for their statements. Instead, they may be using themes that they have received positive feedback on in the past, which has perhaps unconsciously biased them towards certain themes in their writing. We speculate that a similar process might be at work in archaeology, where archaeologists choose topics for their research, in part, based on a pattern of positive or negative feedback on topic choices over time, for example throughout their tertiary education. The implication is that an archaeologist's choices of topic may not be fully deliberate and autonomous and are shaped by the other researchers they interact with, so we all share responsibility for addressing gender imbalances within archaeology.

Support for these structural and contextual influences on researchers' topic selection comes from a meta-analysis of gender and science research by the European Commission (Caprile et al. 2012), which found that structural and life-course factors profoundly shape the distribution of genders in research fields. Socialization factors, such as media representation of scientists and family role models, strongly shape career choices. Life-course factors include the "rush hour," the time when family and academic demands collide and pivotal decisions are made about whether or not to have children and how much to invest or sacrifice for an academic career. Historically, this is a time that leads to women making different choices from their male peers, but this can also affect caregivers of any gender. We see evidence of this

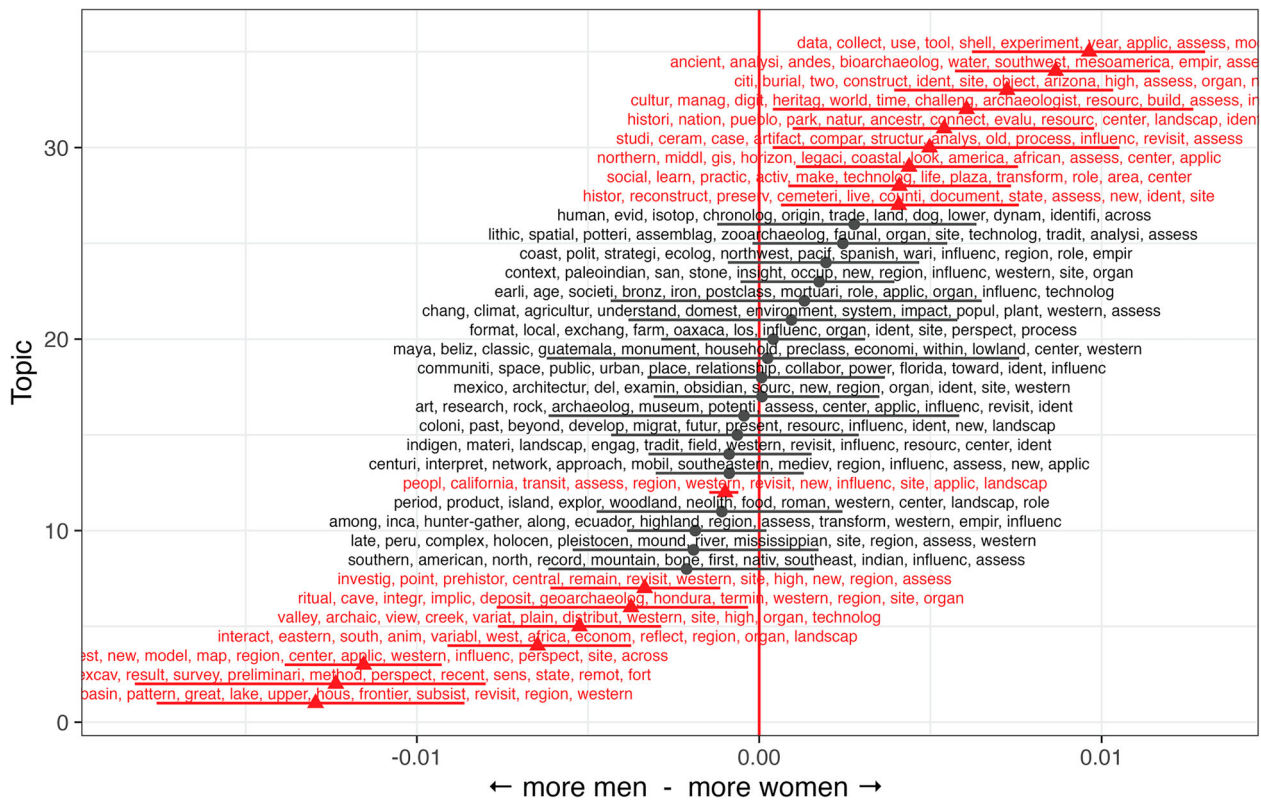


Figure 2. Point estimates and 95% confidence intervals for the estimated marginal effect of gender on each topic identified in titles of presentations at the 2018 SAA meeting. Red triangular points indicate topics with a significant relationship with gender, and black circular points indicate non-significant effects.

among archaeologists in Camp's (2019) intimate account of her experience managing parenting small children and archaeological fieldwork. Camp (2019) relates the substantial logistical, financial, psychological, and other challenges of satisfying her family and professional obligations. Camp's

narrative makes clear how caregivers may be less mobile to conduct field research or relocate for career advancement. This may, in part, explain the prominence of women in GIS and isotope analyses, which may be pursued without requiring travel for fieldwork. These structural and life-



Figure 3. Point estimates and 95% confidence intervals for the estimated marginal effect of gender on each topic identified in titles of presentations at the 2018 EAA meeting. Red triangular points indicate topics with a significant relationship with gender, and black circular points indicate non-significant effects.

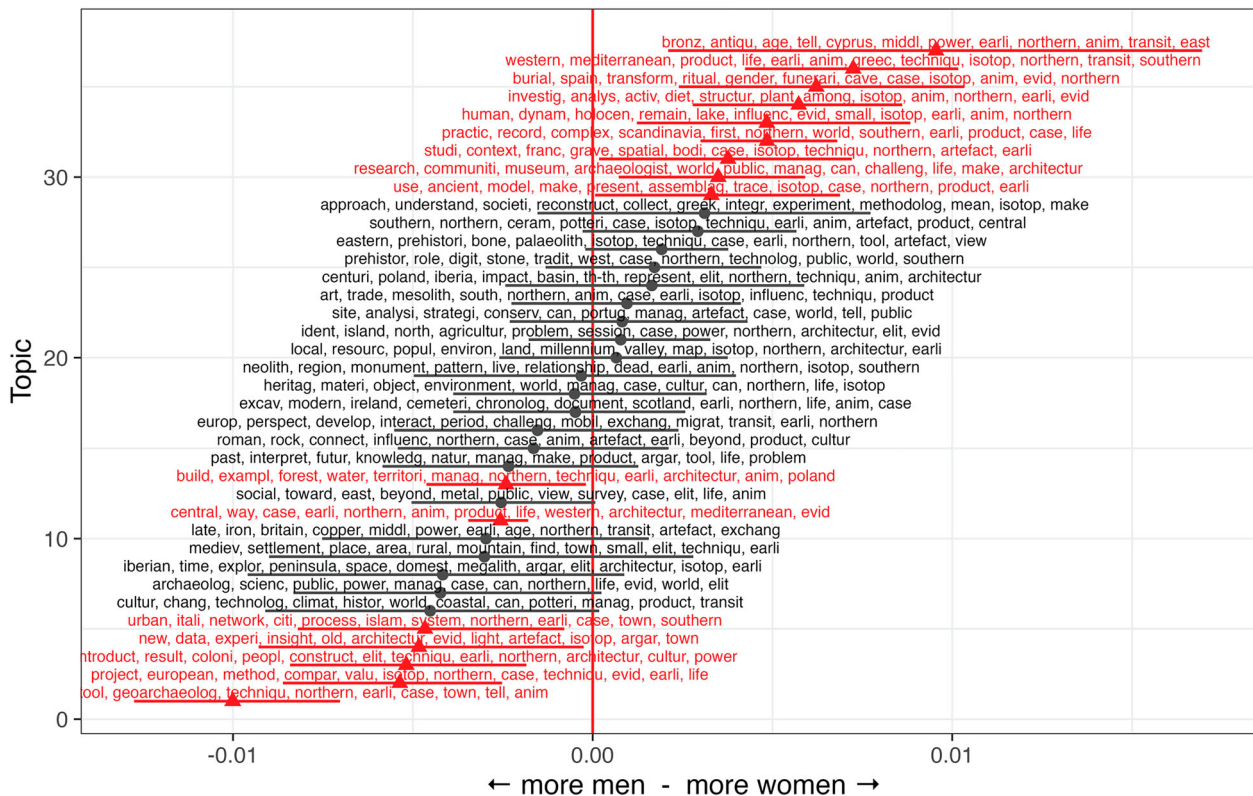


Figure 4. Point estimates and 95% confidence intervals for the estimated marginal effect of gender on each topic identified in titles of presentations at the 2018 CAA meeting. Red triangular points indicate topics with a significant relationship with gender, and black circular points indicate non-significant effects.

course factors may add up to subtle but pervasive exclusionary practices that skew gender representation in research fields that are independent of individual choices and preferences.

These structural factors within archaeology have been examined in detail by Moser (2007), whose pioneering ethnographic observations of archaeological practice in Australia revealed strongly gendered assumptions and expectations. Moser found that participation in archaeological fieldwork was a mechanism that demarcated professionals from non-professionals and was associated with a specific suite of traditionally masculine values (e.g., exploration and adventure in remote locations, physicality, strength, endurance of hardships and ordeals, and drinking alcohol). Women and people who did not possess these attributes had to adopt them to participate in archaeology in socially acceptable ways. Fieldwork is also a key locus of exclusionary structural factors in Leighton's (2020) ethnographic analysis of the gender and class disparities among North American archaeologists working in Bolivia and Chile. She identifies performative informality as a set of dominant values aligned with a predominantly male, Euro-American, middle class, and white sense of fun, openness, friendship, and meritocracy, similar to the traditionally masculine values identified by Moser (2007). Performing this informality correctly ensures junior researchers access to professional opportunities to support career progression. Leighton's observations show that women, people of color, people from working-class backgrounds, and foreigners found it harder to perform this informality correctly and thus were more likely to be excluded from opportunities for career advancement. We speculate that the distinctive informal forms of sociality in archaeology identified by Moser and Leighton, and the

ways that they structure participation in archaeological activities, may be important mechanisms that lead to the exclusion of women from many research topics.

A key limitation of this study is our concept of gender itself and how we measured it. Like many social science studies, we have measured gender assuming it has two binary categories. However, we recognize that many cultures have long included more than two genders (Graham 2004; Wilson 1996), and there is a growing awareness of this in Western cultures, also. A better measure of gender would represent it as a multifaceted spectrum (Tobin et al. 2010). The problem with our binary measure is that it does not reflect our current understanding of gender, forces people into misclassified categories, and is hostile to public acceptance and advocacy for transgender and nonbinary individuals. Our instrument for collecting gender data only returns two categories, so this has limited potential for overcoming this limitation. As a possible solution, we recommend that conference organizers collect gender information directly from presenters using inclusive gender measures (for example, by providing nonbinary options for presenters on registration forms and by asking about gender as an open-ended question for participants to self-identify). We further recommend that future work on gender in archaeology avoid "othering" language when describing results. For example, reporting a sample of "150 participants (48% women; 49% men; 3% other)" may violate ethical standards because such wording implies that binary genders are normal or appropriate, whereas trans and nonbinary genders are not (it is "other"). Our hope is that our discussion of the challenges and limitations of measuring gender will ensure that our study is the last one done by archaeologists to discuss gender as a binary.

Conclusion

We found consistent associations of topics and genders across three major archaeology conferences. Like much previous work (Lippa 2005), the associations we observed are not easily explained by general models such as people/thing or exploratory/abstraction models or previous work by archaeologists, such as the field/lab divide. We speculate that the patterns in our data may result from a combination of subtle, implicit biases that shape the decisions made by early career researchers and their advisers and mentors, as well as large-scale structural constraints embedded in the social milieu of archaeological practice that make certain topics more accessible for one gender than others.

Our results are important because our sample includes scholars at the beginning of their career, such as students and post-doctoral researchers that have yet to publish in a peer-reviewed journal, and thus are not represented or under-represented in studies of gender and publication patterns. As such, our findings have implications for how archaeologists are trained and mentored at the early stages of their careers. First, instructors and mentors should be alert to unintentionally recommending students into classes, research projects, and laboratory or field experiences that might appear to suit their gender, for example, “people” topics for women students. Instead, we should present students with a variety of topics and encourage students to choose based on their interests. Second, senior archaeologists should be intentional about removing structural limitations to participation in certain topics by gender. For example, support for childcare expenses should be available for career-relevant travel, such as fieldwork, ideally paid by grant funds. This may help to equalize professional mobility for women researchers who may have limited capacity to travel with young children.

Third, departments that train archaeologists should ensure that hiring practices support a high diversity of topics and equal representation of genders to minimize historical effects of low diversity that will canalize gender-topic associations, making it harder for students to freely choose research topics independent of their gender. While gender equity in hiring archaeology faculty has improved since the 1990s (Cramb et al. 2022), men continue to be disproportionately hired into tenure-track positions, relative to PhD graduation rates (Speakman et al. 2018). A history of low gender diversity in the archaeology professoriate has been documented by Brown (2018), who found that the low rate of women as professors and other senior leadership positions in archaeology results in a confounding effect on female students’ ability to find suitable models and mentors. This may have a cascading effect on the kinds of topics that women students choose in their research career.

Our work implies that the negative effects of a low rate of women professors is not limited to female students, because without women professors, students of any gender may be unable to pursue certain research topics that currently tend to be pursued by women. Similarly, supporting women’s participation in fieldwork is likely to have a positive effect on junior researchers of all genders, who can benefit from increased sharing of expertise on topics currently concentrated among women researchers. It is our hope that studies such as ours will stimulate a more active consideration of gender-topic associations that will lead to a more equitable future for archaeology.

Our method of computational text analysis, specifically structural topic models, has potential to investigate

additional intersecting dimensions of inequality and exclusion in archaeology. The three conferences examined here took place behind visa and economic walls that limit participation by scholars from the Global South. Obtaining visas and funding to travel to the US and Europe is often impossible for researchers from African, Asian, Middle Eastern, and low-income countries (see Smith 2007 introducing papers in *Archaeologies* 3:2 from eight archaeologists describing their personal experiences). If conference organizers collect data from participants on their country of residence, then we can study this problem quantitatively to complement the previous qualitative research. Future research using our methods could help to identify what topics might be missing or underrepresented from our conferences because of the political and economic barriers to participation.

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References

- Bardolph, D. N. 2014. “A Critical Evaluation of Recent Gendered Publishing Trends in American Archaeology.” *American Antiquity* 79 (3): 522–540. <https://doi.org/10.7183/0002-7316.79.3.522>.
- Bardolph, D. N. 2018. “Controlling the Narrative: A Comparative Examination of Gendered Publishing Trends in the SCA and Beyond.” *California Archaeology* 10 (2): 159–186. <https://doi.org/10.1080/1947461X.2018.1535813>.
- Beck, J., E. Gjesfjeld, and S. Chrisomalis. 2021. “Prestige or Perish: Publishing Decisions in Academic Archaeology.” *American Antiquity* 86 (4): 669–695. <https://doi.org/10.1017/aaq.2021.64>.
- Blevins, C., and Mullen L. 2015. “Jane, John ... Leslie? A Historical Method for Algorithmic Gender Prediction.” *DHQ: Digital Humanities Quarterly* 9 (3). <http://www.digitalhumanities.org/dhq/vol/9/3/000223/000223.html>
- Brown, K. M. 2018. “Gender, Race, and Mentorship: A Perspective from California Archaeology.” *California Archaeology* 10 (2): 187–209. <https://doi.org/10.1080/1947461X.2018.1535814>.
- Camp, S. L. 2019. “Fieldwork and Parenting in Archaeology.” In *Mothering from the Field: The Impact of Motherhood on Site-Based Research*, edited by B. M. Muhammad, and M.-A. Neuilly, 27–42.

- New Brunswick, Camden, and Newark, New Jersey, and London: Rutgers University Press.
- Caprile, M., E. Addis, C. Castaño, I. Klinge, M. Larios, D. Meulders, J. Müller, et al. 2012. "Meta-Analysis of Gender and Science Research. Synthesis Report." *European Commission*, <https://doi.org/10.2777/75176>.
- Chang, J., S. Gerrish, C. Wang, J. L. Boyd-Graber, and D. M. Blei. 2009. "Reading Tea Leaves: How Humans Interpret Topic Models." *Advances in Neural Information Processing Systems* 22: 288–296.
- Chase, D. Z. 2021. "The Academy, and Women: Finding One's Own Path." *Heritage* 4 (3): 1725–1736. <https://doi.org/10.3390/heritage4030096>.
- Cislak, A., M. Formanowicz, and T. Saguy. 2018. "Bias Against Research on Gender Bias." *Scientometrics* 115: 189–200. <https://doi.org/10.1007/s11192-018-2667-0>.
- Claassen, C. 1994. *Women in Archaeology*. Philadelphia: University of Pennsylvania Press.
- Cramb, J., B. T. Ritchison, C. S. Hadden, Q. Zhang, E. Alarcón-Tinajero, X. Chen, K. C. Jones, T. Jones, K. Napora, M. Veres and V. D. Thompson. 2022. "The Changing Profile of Tenure-Track Faculty in Archaeology." *Advances in Archaeological Practice* 10 (4): 371–381. <https://doi.org/10.1017/aap.2022.8>.
- Fulkerson, T. J., and S. Tushingham. 2019. "Who Dominates the Discourses of the Past? Gender, Occupational Affiliation, and Multivocality in North American Archaeology Publishing." *American Antiquity* 84: 379–399. <https://doi.org/10.1017/aaq.2019.35>.
- Gero, J. M. 1983. "Gender Bias in Archaeology: A Cross-Cultural Perspective." In *The Socio-Politics of Archaeology*, edited by J. M. Gero, D. M. Lacy, and M. L. Blakey, 51–57. Amherst, MA: Department of Anthropology, University of Massachusetts.
- Gero, J. M. 1994. "Excavation Bias and the Woman at Home Ideology." *Archeological Papers of the American Anthropological Association* 5: 37–42. <https://doi.org/10.1525/ap3a.1994.5.1.37>.
- Graham, S. 2004. "It's Like One of Those Puzzles: Conceptualising Gender among Bugis." *Journal of Gender Studies* 13: 107–116. <https://doi.org/10.1080/0958923042000217800>.
- Hamilton, M. C., D. Anderson, M. Broadus, and K. Young. 2006. "Gender Stereotyping and Under-Representation of Female Characters in 200 Popular Children's Picture Books: A Twenty-First Century Update." *Sex Roles* 55: 757–765. <https://doi.org/10.1007/s11199-006-9128-6>.
- Heath-Stout, L. E. 2020a. "Guest Editorial Introduction: Gender, Equity, and the Peer Review Process at the Journal of Field Archaeology." *Journal of Field Archaeology* 45 (3): 135–139. <https://doi.org/10.1080/00934690.2020.1719295>.
- Heath-Stout, L. E. 2020b. "Who Writes About Archaeology? An Intersectional Study of Authorship in Archaeological Journals." *American Antiquity* 85 (3): 407–426. <https://doi.org/10.1017/aaq.2020.28>.
- Heath-Stout, L. E., and C. L. Jalbert. 2023. "Funding in the 'Field': An Analysis of Demographics and Methods in National Science Foundation Archaeology Grants (1955–2020)." *Journal of Field Archaeology* 48 (2): 102–112. <https://doi.org/10.1080/00934690.2022.2154999>.
- Kretzler, I., and B. Marwick. 2015. "Investigating Archaeologists' Engagement with Feminist Theory Using Textual Macroanalysis: 25 Years After Chacmool 1989." In *BREAKING BARRIERS: Proceedings of the 47th Annual Chacmool Archaeological Conference November 7-9 2014*, edited by R. Crook, K. Edwards, and C. Hughes, 158–168. Calgary, Alberta, Canada: The Chacmool Archaeological Association of the University of Calgary.
- Leighton, M. 2020. "Myths of Meritocracy, Friendship, and Fun Work: Class and Gender in North American Academic Communities." *American Anthropologist* 122: 444–458. <https://doi.org/10.1111/aman.13455>.
- Lincoln, M. n.d. Gender: Predict Gender from Names using Historical Data. R Package Version 0.5. 2. 2018.
- Lippa, R. A. 2005. *Gender, Nature, and Nurture*. Routledge.
- Marwick, B. 2017. "Computational Reproducibility in Archaeological Research: Basic Principles and a Case Study of Their Implementation." *Journal of Archaeological Method and Theory* 24: 424–450. <https://doi.org/10.1007/s10816-015-9272-9>.
- Marwick, B., C. Boettiger, and L. Mullen. 2018. "Packaging Data Analytical Work Reproducibly Using R (and Friends)." *The American Statistician* 72: 80–88. <https://doi.org/10.1080/00031305.2017.1375986>.
- Mihaljević, H., M. Tullney, L. Santamaría, and C. Steinfeldt. 2019. "Reflections on Gender Analyses of Bibliographic Corpora." *Frontiers in Big Data* 2: 29. <https://doi.org/10.3389/fdata.2019.00029>.
- Mimno, D., and Lee, M. 2014. "Low-Dimensional Embeddings for Interpretable Anchor-Based Topic Inference." In *Proceedings of the 2014 Conference on Empirical Methods in Natural Language Processing (EMNLP)*: 1319–1328. <https://doi.org/10.3115/v1/D14-1138>.
- Miner, J. B. 1922. "An Aid to the Analysis of Vocational Interests." *The Journal of Educational Research* 5: 311–323. <https://doi.org/10.1080/00220671.1922.10879258>.
- Moser, S. 2007. "On Disciplinary Culture: Archaeology as Fieldwork and Its Gendered Associations." *Journal of Archaeological Method and Theory* 14: 235–263.
- Ostapenko, L., C. Schonhardt-Bailey, J. W. Sublette, D. S. Smink, and N. Y. Osman. 2018. "Textual Analysis of General Surgery Residency Personal Statements: Topics and Gender Differences." *Journal of Surgical Education* 75: 573–581. <https://doi.org/10.1016/j.jsurg.2017.09.021>.
- R Core Team. 2019. *R: A Language and Environment for Statistical Computing*. R Foundation for Statistical Computing. Vienna, Austria.
- Roberts, M., B. Stewart, D. Tingley, K. Benoit, M. B. Stewart, L. Rcpp, R. Imports MatrixStats, and N. KernSmooth. 2019. Package 'stm'.
- Roberts, M. E., B. M. Stewart, D. Tingley, C. Lucas, J. Leder-Luis, S. K. Gadarian, B. Albertson, and D. G. Rand. 2014. "Structural Topic Models for Open-Ended Survey Responses." *American Journal of Political Science* 58: 1064–1082. <https://doi.org/10.1111/ajps.12103>.
- Rodríguez-Álvarez, X., and Lozano, S. 2018. "Gender Balance in the Scientific Production of the Atapuerca Archaeological and Palaeontological Research Project." *Journal of Anthropological Sciences* 96: 1–8. <https://doi.org/10.4436/jass.96002>.
- Sinclair, A. 2016. "The Intellectual Base of Archaeological Research 2004–2013: A Visualisation and Analysis of its Disciplinary Links, Networks of Authors and Conceptual Language." *Internet Archaeology* 42), <https://doi.org/10.11141/ia.42.8>.
- Smith, C. 2007. "Visa Stories: Human Rights, Structural Violence and Ethical Globalisation." *Archaeologies* 3 (2): 179–185. <https://doi.org/10.1007/s11759-007-9020-1>.
- Speakman, R. J., C. S. Hadden, M. H. Colvin, J. Cramb, K. C. Jones, T. W. Jones, I. Lulewicz, K. G. Napora, K. L. Reinberger, B. T. Ritchison, A. R. Edwards, and V. D. Thompson. 2018. "Market Share and Recent Hiring Trends in Anthropology Faculty Positions." *PLOS ONE* 13 (9): e0202528. <https://doi.org/10.1371/journal.pone.0202528>.
- Stoet, G., and D. C. Geary. 2022. "Sex Differences in Adolescents' Occupational Aspirations: Variations Across Time and Place." *PLOS ONE* 17: e0261438. <https://doi.org/10.1371/journal.pone.0261438>.
- Su, R., J. Rounds, and P. I. Armstrong. 2009. "Men and Things, Women and People: A Meta-Analysis of Sex Differences in Interests." *Psychological Bulletin* 135: 859. <https://doi.org/10.1037/a0017364>.
- Thelwall, M., C. Bailey, C. Tobin, and N. Bradshaw. 2019. "Gender Differences in Research Areas, Methods and Topics: Can People and Thing Orientations Explain the Results?" *Journal of Informetrics* 13: 149–169. <https://doi.org/10.1016/j.joi.2018.12.002>.
- Tobin, D. D., M. Menon, M. Menon, B. C. Spatta, E. V. Hodges, and D. G. Perry. 2010. "The Intrapyschics of Gender: A Model of Self-Socialization." *Psychological Review* 117: 601. <https://doi.org/10.1037/a0018936>.
- Tomášková, S. 2011. "Landscape for a Good Feminist. An Archaeological Review." *Archaeological Dialogues* 18 (1): 109–136. <https://doi.org/10.1017/S1380203811000158>.
- Tushingham, S., T. Fulkerson, and K. Hill. 2017. "The Peer Review Gap: A Longitudinal Case Study of Gendered Publishing and Occupational Patterns in a Female-Rich Discipline, Western North America (1974–2016)." *PLOS ONE* 12 (11): e0188403. <https://doi.org/10.1371/journal.pone.0188403>.
- Wilson, A. 1996. "How we Find Ourselves: Identity Development and Two Spirit People." *Harvard Educational Review* 66: 303–318. <https://doi.org/10.17763/haer.66.2.n551658577h927h4>.
- Xu, Y. J. 2008. "Gender Disparity in STEM Disciplines: A Study of Faculty Attrition and Turnover Intentions." *Research in Higher Education* 49: 607–624. <https://doi.org/10.1007/s11162-008-9097-4>.