Identity and Publishing in Archaeometallurgy

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Publication Strategy, Archaeology, Archaeometry, Interdisciplinary, Peer-Review, Scientific Outreach

Abstract

This paper covers aspect of the gender, education, and current profession of individuals engaged in archaeometallurgy from an anonymous questionnaire submitted by the authors to the ARCH-METALS LISTSERV. While the questionnaire itself was answered by only a fraction of the total list members, and likely excludes a portion that do not subscribe, we believe those that responded are some of the most active individuals in the field and it therefore has value as the first self-reflexive poll of its kind. It allowed the authors to obtain anonymous information regarding the academic training of practicing archaeometallurgists, and aspects of the review and paper publication preferences in the field. Recommendations for improving publishing and review speed are also discussed based on the questionnaire results and current review literature.

Introduction

What makes for an archaeometallurgist, and how does one most effectively contribute to scholarly discourse in the field through publication and outreach? An anonymous questionnaire themed to answer these questions was sent out by the authors to the ARCH-METALS LISTSERV in order to better understand the current state of the field. One hundred and thirty three users responded from the list with answers for the given questions and some additional suggestions (see the questionnaire below). Moreover, the questionnaire gathered information regarding the importance of Impact Factor (IF), Open Access (OA), and the peer review process to the lists members. Suggestions on how to improve the publication process and outreach to other disciplines was suggested by the respondents and is later discussed in relation to current review research. The questions and answers were, at first, merely meant as an overview without formal statistical backing, which were presented at the annual conference of the European Association of Archaeologists in Maastricht, September 2017. The presentation of these data later led to a request for their publication.

While chemical analyses of old metal have been undertaken for the purposes of understanding the past as early as 1790 (Pollard, 2013), and may be seen as a precursor to the formalization of archaeometallurgy, what comprises the work of a modern archaeometallurgist has diverged significantly from these humble beginnings with research interests that are not easily characterized. The questionnaire was therefore primarily focused on understanding the diversity of the materials studied, and background of those that have contribute to the field, and, secondly, to identify possible issues and compromises inherent to that diversity in the publication process. The ARCH-METALS LISTSERV is an established network for archaeometallurgical practitioners that has existed for over 20 years, and was therefore considered the best source for this information. The list itself is not exclusive to academics and/or archaeometallurgical specialists, and includes individuals from the general public.

In the first instance of what makes an archaeometallurgist, one must first understand what comprises, and who contributes, to the field. As a hybridization of several academic disciplines, and one that does not exclusively borrow aspects from archaeology and metallurgy, as the name suggests, archaeometallurgy is perhaps best characterized as a field that utilizes any number of aspects of other fields to elucidate cultural and historical meaning from the study of metal and related materials (for a more in depth explanation and history, see Rehren and Pernicka (2008)). In regard to the borrowed aspects from

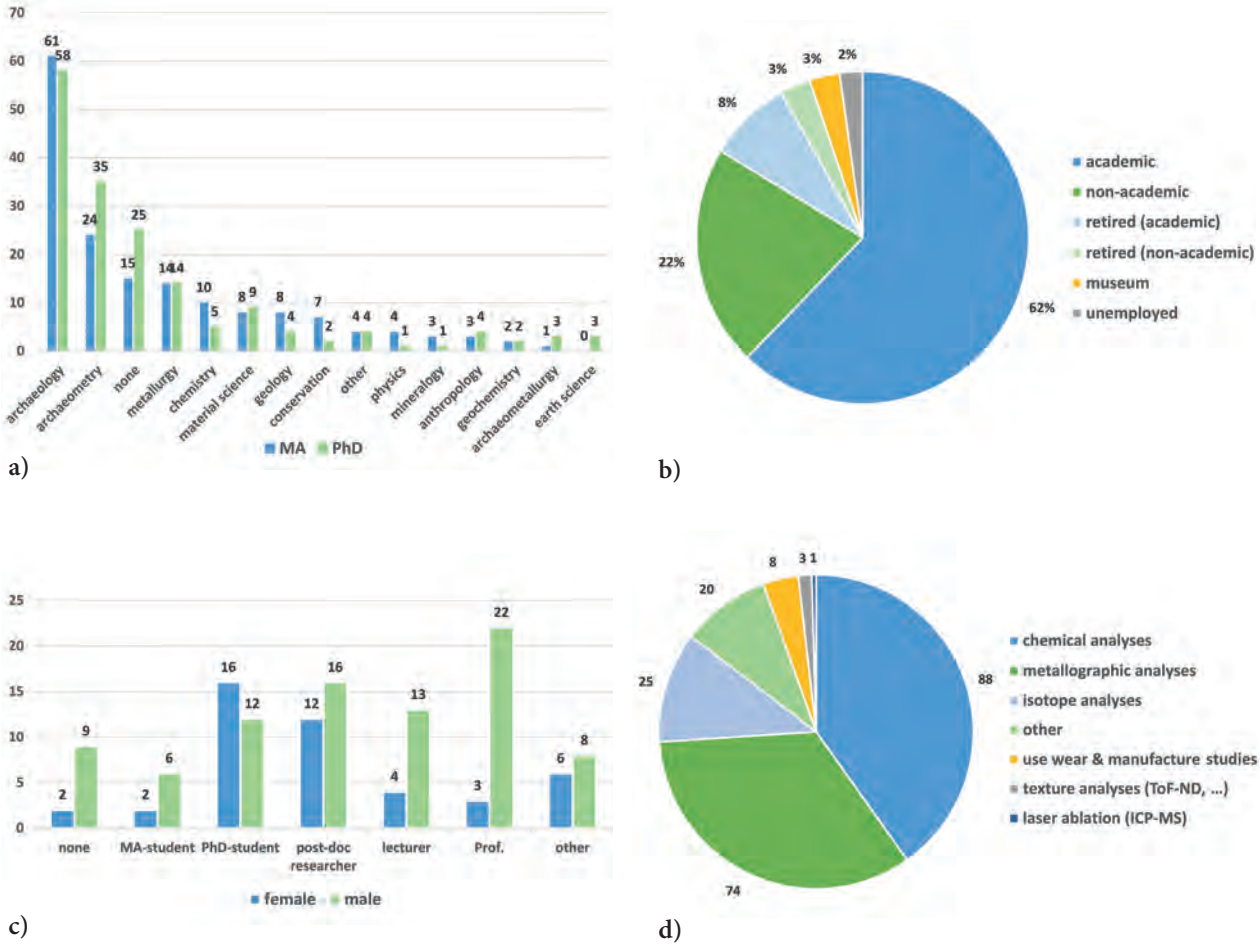


Figure 1. **a)** Formal degrees attained (n=130). **b)** Place of work (n=131). **c)** Highest attained academic position and gender balance (n=131). **d)** Analytical specialization (n=119). "Other" comprises visual examination, paleomagnetism, spatial analyses, experimental archaeology, history, excavations, and more.

other fields, the multidisciplinarity of archaeometallurgy brought by scholars throughout academia is overwhelming such that, in agreement with Killick (2001) and (2014), attaining competency in all of but a few of its many facets is possible.

In the second instance, for contributions to the field and outreach, the authors believe that one must draw upon the diverse nature, experience, and circumstance of those in the field to bolster collaborative discourse and improve publication methods. For instance, responses to the questionnaire by scholars with permanent positions versus those that aspired for them, diverged in several key aspects regarding the state of current publishing procedures. Opinions for improving publication processes, often aligned with the career status and interest of each participant, resulting in a myriad of very specific responses. Given the variety of these responses, likely due to the diverse academic focuses of those who practice archaeometry (Killick and Fenn, 2012; Killick, 2014; Killick, 2015), and archaeometallurgy in particular (e.g. Cleere, 1993; Hauptmann, 2007; Pernicka, 2004), it is reasonable to infer that improving the publication and dissemination of information processes in archaeometallurgy would be challenging.

Archaeometallurgists are, or, rather, those who collaborate towards common research goals related to the metal material past, according to a recent overview of the field published by Killick and Fenn (2012), include: archaeologists, historians, numismatists, philologists, geologists, materials scientists, chemists, physicists, limnologists, botanists, toxicologists, mining engineers, blacksmiths, goldsmiths, and conservation scientists. And to this list, which is already expansive and without necessarily obvious connections between each field and archaeometallurgy, one can also add the following subfields: ethnoarchaeology, economic history, the history of technology, the history of philosophy, social anthropology, mineralogy, petrology, geochemistry, economic geology, extractive metallurgy, physical metallurgy, foundry practice, ceramic technology, corrosion and conservation science, and forestry (Killick, 2014). In addition, these authors would also include the follow-

ing fields and subfields: ecological engineering, physical chemistry, thermodynamics, and the earth sciences. Given the expanse of knowledge covered by these combined lists, defining an archaeometallurgist by education and field in simple terms is impractical. Part of the diverse scholarly interest and contribution to the field may stem from the fact that archaeometallurgy is rarely taught in exclusivity, rather being part of more well-rounded interdisciplinary degree courses, where they exist, such as those offered at Ruhr-Universität Bochum, University of Nottingham, Eberhard Karls Universität Tübingen, University College London, IGERT at the University of Arizona, and the Weizmann Institute of Science in Israel.

Lastly, one of the seminal issues in archaeometallurgy, which is shared throughout academia since the onset of electronic publication and increased interdisciplinarity (Sullivan, 1996), is in the ability of reviewers to accommodate the increased volume and assess the information given in submitted articles (Gyles, 2014; Killick, 2015; Schwartz and Zamboanga, 2009). Publication, and reaching ones intended audience, has therefore become increasingly difficult. The Journal of Archaeological Science (JAS) and Archaeometry perhaps best underscores the problem in archaeometallurgy wherein the number of papers submitted, page count, and the fields of those that have contributed, have all increased dramatically in recent years (Killick and Goldberg, 2009; Killick, 2015; Torrence, Martinón-Torres and Rehren, 2015). It would seem that the study of the past has garnered interest across academia, and that scholars have responded by contributing their unique expertise.

Methods

The questionnaire was made available to the 575 members of the LISTSERV from 19 June - 5 July, 2017, and 100 of those who participated completed the questionnaire with a small number of answers omitted. The questions and answers are given and discussed below. It is unknown how many members of the list are currently active, and it is therefore impossible to ascertain the sample size. Furthermore, since the field of archaeometallurgy is, by its namesake, a homogenization of two fields and in practice unrestricted to either, it is difficult to identify what makes for an archaeometallurgist. Contributors to the field often consider their work elective, and their designation as archaeometallurgists, personal. Consequently, it is likely impossible to determine, or even roughly estimate, the population of archaeometallurgists given the tenuous affiliation of individuals to the field and the data at hand. The questionnaire merely notes each respondent's field and whether they consider themselves archaeometallurgists. The information collected is far from comprehensive and not suitable for statistical consideration.

Results

Academic position and materials studied

Turning now to the results of the questionnaire, it was shown that archaeometallurgy is predominantly represented by those that foremost identify as archaeologists and archaeometrists. Responding members generally indicated having higher level formal degrees, either an MA or PhD, or perhaps both, in archaeology, followed closely by archaeometry. Surprisingly, few people indicated having a degree in metallurgy, chemistry, or material science, and even fewer in geology or geochemistry (Figure 1a). Further, while many noted having degrees in fields and subfields related to archaeometallurgy, only four held formal degrees specifically in the field. There were also a good number of individuals that indicated not having a formal degree of any kind. Thirteen of the respondents, meanwhile, felt that they did not belong to any of the above fields and subfields, 12 considered archaeometallurgy constituted only a small part of their larger research objectives, and 11 indicated that they were trained in other fields. While most of the respondents work in school or university settings (84 with 11 retired), many are in non-academic fields (29 with 4 retired) or museums (4). Three women indicated that they are currently unemployed (Figure 1b).

Regarding the focus of the respondents, most study copper and copper-based alloys (echoing a similar study carried out by Montero-Ruiz and López-Romero González de la Aleja (2006)), while a smaller proportion concentrate on precious metals and iron and steel (Table 1). Few are interested in lead and lead-based alloys, tin, zinc, and pewter. Study of associated metal-making and smelting/melting waste materials of the above listed metals was in all cases significantly less, suggesting a fieldwide proclivity towards finished objects rather than their production technology. From a total of 119 responses, 88 focused on chemical analyses, 74 on metallography, and 25 on isotopes (Figure 1d).

Particularly striking from the questionnaire was the gender imbalance for professors and lecturers working in archaeometallurgy with a seven times male majority. This majority stands in stark contrast to the balanced number of male and female doctoral students and postdocs, confirming a previous report that most women do

Table 1. Metals and alloys studied by the respondents (n=126).

metal / alloy	Objects	Waste Materials	Crucibles, Smelting / Melting Related Objects
Cu	100	63	71
CuSn	97	53	61
CuAs	73	35	38
Other Cu-alloys	69	32	37
CuZn	64	27	31
Au, Ag	71	28	32
Fe	64	51	49
Steel	45	29	28
Pb	7	4	4
Pb-alloys	1	1	1
Sn	3	1	3
Pewter	2		
Zn	1		

not go on to hold academic positions (SHE FIGURES, 2016) (Figure 1c).

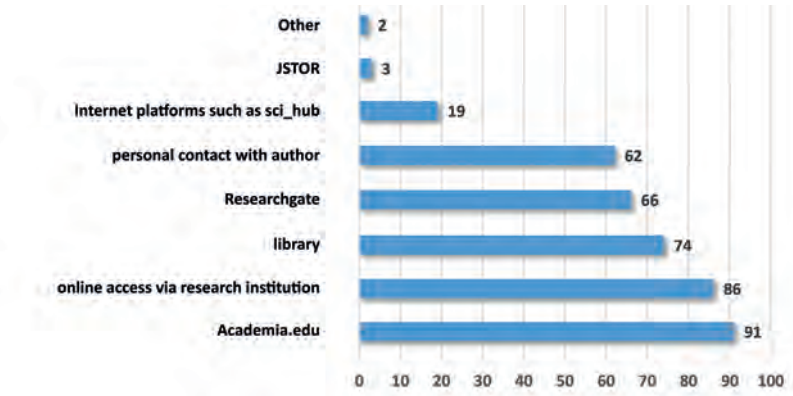
Publishing preferences and impact factor

When asked which journals the respondents published, those most often noted were JAS, Historical Metallurgy, and Archaeometry (Table 2). There is a clear preference towards publishing in higher impact factor (IF) journals specifically for archaeological and historical research, with far less interest in those focused in the sciences and with lower IF. Most of those surveyed indicated that they typically publish case and general studies and basic research, with smaller contributions to experimental archaeology and fieldwork reports (Table 3). Access to archaeometallurgically related publications was also not an issue (contra Killick, 2015) (Figure 2a), and IF was viewed as more important to those with temporary positions than permanent ones (Figure 2b).

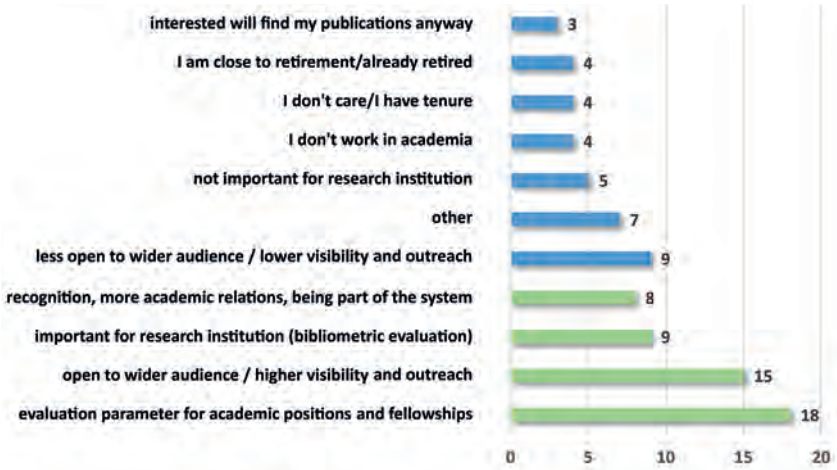
Table 2. Journals in which the questionnaire respondents submit publications (n=104 to 105).

no. participants	Journal	IF (2016)	permanent (n=43)	non-permanent (n=44)
49	Journal of Archaeological Science	2.602	19	14
30	Historical Metallurgy	–	9	9
29	Archaeometry	1.470	10	8
18	Antiquity	1.536	10	4
16	Journal of Archaeological Science: Reports	–	7	2
12	Journal of Archaeological and Anthropological Science	1.844	4	3
11	Der Anschnitt	–	4	4
9	JOM	1.860	3	4
7	Journal of Applied Physics	2.068	3	1
7	Materials Characterization	2.714	2	2
7	PLoS ONE	2.806	4	–
5	Archaeosciences	–	2	–
5	Mediterranean Archaeology and Archaeometry	–	3	1
4	Materials Science and Technology	1.538	2	–
4	Oxford Journal of Archaeology	–	2	–
3	Acta Metallurgica et Materialia (until 1995)	–	1	1
3	PNAS	9.661	2	–
3	Proceedings Prehistoric Society	–	1	–

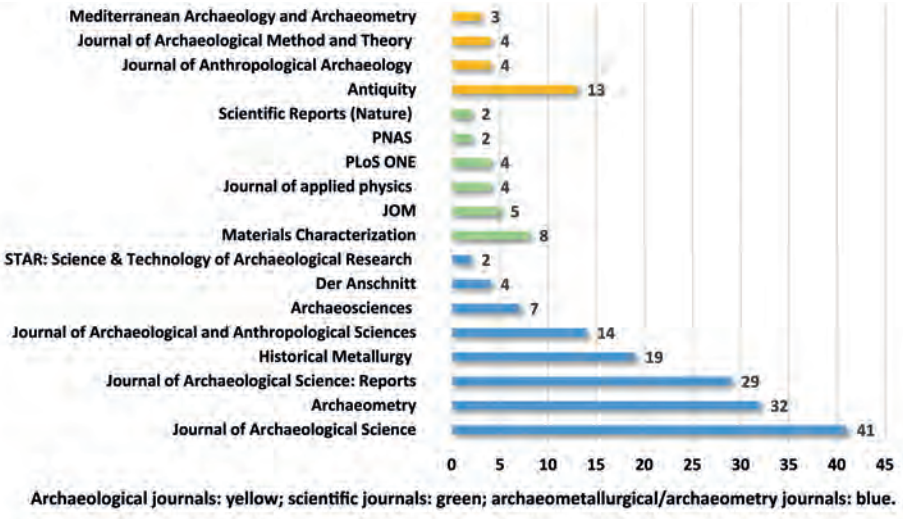
a)



b)



c)



d)

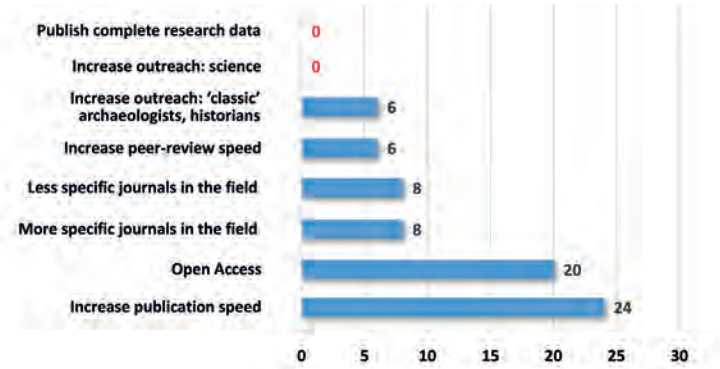


Figure 2. **a)** Access to publications (n=105). **b)** Importance of impact factor: important (n=50; green), and not important (n=36; blue). **c)** Reviewers for different journals (note: only journals with more than one respondent identified as having acted as a reviewer). **d)** Suggestions made by the respondents that in their view would improve the publication process.

Table 3. Where respondents publish their work (n=110). Bracketed numbers indicate no contributions in the given category.

	Archaeology	Archaeometry	Scientific	Other
Book chapters	56 (30)	39 (49)	13 (67)	3
Monographs	38	18	6	4
Journal articles	55 (19)	50 (28)	23 (53)	7
Conference proceedings	50 (28)	45 (37)	17 (68)	6

Peer review and outreach

One hundred and one of the respondents indicated that they are reviewers with the majority reading for archaeologically and archaeometallurgically related journals, and far fewer for scientific ones (Figure 2c). Thirty one respondents indicated that they were not reviewers for the journals listed in Figure 2c, while 17 noted reviewing for others that are archaeological in scope. In order to improve the review and publication process, the majority of those surveyed, mirroring the desire of past peer review studies (e.g. Boellstorff, 2010; Ware, 2008), noted a need for faster publication and open access (Figure 2d). The results were evenly split for increasing and decreasing the number of journal specifically for archaeometallurgy; outreach to archaeologists and historians was suggested, and no one was concerned with working more closely with scientists. Only two respondents, each, suggested the publishing of data tables and a monthly update for new archaeometallurgical publications. Particular criticism was also raised towards the current state of journal publishing procedures, and the lack of an online presence of Historical Metallurgy.[1]

Discussion

Based on the questionnaire results, the membership spectrum of the ARCH-METALS LISTSERV ranges from scholars with high-level formal degrees to interested individuals from the public. The number of respondent members from academia notably far outweighed those from the public. The difference in number may be a result of the questions themselves, being aimed at academics, and the fact that the list itself is sequestered and contains esoteric subject matter. Of the respondents, many indicated that their field was not in fact archaeometallurgy, or one that is necessarily and obviously connected to archaeology, and few were specifically trained in the field itself. The lack of archaeometallurgists may be due to the focus of archaeometric training courses, which commonly teach the analysis and interpretation of several cultural materials rather than metal in isolation. Many archaeometallurgical practitioners also primarily have training in the sciences and not archaeology or archaeometallurgy, which we view positively as it invites a variety of perspectives and methods from other fields that help keep archaeometallurgy in pace with advances made in the sciences and social sciences (e.g. Giussani, Monticelli and Rampazzi, 2009; Jones, 2016; Nevin, Spoto and Anglos, 2012). However, such advancements may lead to further delays in the review and publishing process, since qualified reviewers in newly introduced subject matter must be sought (e.g. Killick, 2015; Lee, 2006).

The slow pace of peer review in archaeometallurgically related journals was criticised by several of the respondents (Figure 2d), which is a common concern shared throughout academia. While there are no studies focused on increasing the speed of peer review in archaeometallurgy, some information about the issue can be inferred from a wider academic context. Studies conducted by Chetty, Saez and Sándor (2014) and Ware (2008), in the *Journal of Public Economics* and *Publishing Research Consortium*, respectively, offer insight into increasing the speed of reviews. In brief, Chetty, Saez and Sándor found that faster reviewer turnover rates can be achieved by monetary and social incentives. Both forms of incentive were likely effectual because reviewers tended to view faster turnover rates as part of their normal responsibilities and/or something that should be rewarded (Sullivan, 1996). It should, however, be considered that while monetary rewards were effectual, such a practice may have a negative effect by eroding the sense of social responsibility reviewers have to their field (Chetty, Saez and Sándor, 2014). A similar response to the issue of reviewer payment was noted by Ware (2008), who additionally showed that opinions on the issue of monetary rewards were irrespective of field and reviewer participation was overwhelming altruistic rather than economic. Furthermore, in comparison to the questionnaire, it was revealed that scholars that held permanent

positions were less concerned with financial reward for reviews compared to those with temporary fellowships or contracted work. Meanwhile, for both, social recognition and publishing in one's own field were considered important factors in proving academic worth. It is perhaps not surprising, then, that responsibility to one's field was more effectual in promoting reviewer turnover, since it has been found that there is intrinsic motivation in a shared social network (Chetty, Saez and Sándor, 2014). Given that social incentivization is a strong driver behind reviewer turnover, and because monetary incentives are an unlikely eventuality due to increased publishing costs, at the very least we believe greater recognition should be given to reviewers in alternative ways (Engler and Stausberg, 2006; Meadows, 2016; Scott, 2017). Ware (2008) suggests several options to express reviewer appreciation that include: a free subscription to the journal, acknowledgement in the journal itself, and payment in kind. In regard to payment in kind, Elsevier now offers certificates and discounts to reviewers that can be used towards discounts for services and in their online shops.

Recognition is also an important driver in the selection of journals chosen by younger and untenured scholars for publication. The results of the questionnaire (Figure 2b) showed that there is a clear preference towards those with higher IF, however, there is also the desire to publish in journals specifically for archaeological and historical research with far less interest in those focused in the sciences. Furthermore, those who personally cared less about journal and IF typically held high-level and permanent positions, yet considered both important for evaluating younger scholars for grants and employment. The preference of publication venue by younger scholars, and their desire to gain recognition among their colleagues, seems, then, to be the strongest driver in journal selection.

Publishing in recognized scholarly outlets is considered a prime indicator in most fields of scholarly worth, leading to advancement and funding. Unfortunately, the desire for recognition in one's field has also led some to prioritize quantity, which has resulted in low quality publications simply for the sake of increased numbers (Sullivan, 1996; Koop and Pöschl, 2006). In archaeometallurgy, given the multidisciplinary nature of contributions, and the increased number and length of articles, such a practice would likely further stress reviewers and delay publication timelines. On the other hand, adopting good scientific practices, such as those that include full explanations of methodological approaches, adherence to and use of standards, and making all data readily available (Killick, 2015; Pearce, 2016), can help hasten the review process (Lee, 2006).

In regard to improving publication speed, caused predominantly by slow review processes, several alternative methods can be employed. To our knowledge the majority of the below listed methods have not been attempted in archaeometallurgical journals, but have been discussed and tested elsewhere in other fields (e.g. Boellstorff, 2010; Fitzpatrick, 2009; Schwartz and Zamboanga, 2009; Stausberg and Engler, 2016; Stausberg and Engler, 2018; Ware, 2008; Weale, 2009). The most notable attempt to disassemble the benefits of alternative review processes was undertaken by the journal *Nature* in a series of peer review articles in 2006 (e.g. Akerman, 2006; Anderson, 2006; Groves, 2006; Koonin, et al., 2006; Koop and Pöschl, 2006; Lahiri, 2006; Lee, 2006; Lee and Bero, 2006; Sandewall, 2006). From these articles, the following list summarizes and groups proposed and employed review methods that may be applicable to archaeometallurgy. Recommendations based on this list are made in the following section of this paper in accordance with wishes of the questionnaire respondents for anonymity in the review process.

[1] A proposed peer group review methodology where articles are sent out to reviewers and formally discussed within their research group with postdocs, graduate students, and other researchers. The author's name would be removed along with identifying information such as non-scientific and non-technical information (Lahiri, 2006). This approach offers up-and-coming scholars experience in paper review, as well as input into the clarification, and improved usefulness, of articles for non-experts. The caveat of this method is that smaller fields such as archaeometallurgy would not see the same benefits where the work of both individuals and groups could be more easily identified.

[2] Koop and Pöschl (2006), editors of *Atmospheric Chemistry and Physics*, discuss a system where authors and reviewers openly discuss manuscripts and use a two-staged review process. The first stage is a rapid pre-screening of the work, after which it is published as a "discussion paper". After an eight week public discussion, where anonymity of reviewers is optional, the paper is reviewed by experts for publication in the main journal. The editors note that this method boosts paper quality and relieves editors and reviewers from spending too much time on low quality submissions. Boellstorff (2010) describes a similarly employed system in *American Anthropologist*, where he, as the editor, pre-screens submissions. He checks that the articles are suitable for the journal and sufficiently well written, and that the abstract accurately reflects the paper's content. By checking

the abstract he ensures that appropriate reviewers are quickly found.

[3] Koonin et al. (2006) discuss a system employed in *Biology Direct* where authors select their own reviewers. The authors found high interest in the approach and positive results compared to traditional peer review methods, but do not suggest replacing expert reviewers. Groves (2006), deputy editor for the *British Medical Journal*, describes a similarly employed approach whereby authors and reviewers know each other, a list of declarations of conflicts of interests between reviewers and authors is made public, and reviewers are told research protocols and can ask authors to provide raw data. The benefit of knowing one's reviewer is that they are more helpful, less hostile, and take greater interest in a paper's publication (DeCoursey, 2006).

[4] Sandewall (2006) discusses an open review system where papers are submitted to the journal and notice is sent by email to a peer review community. Papers are usually reviewed openly for three weeks without anonymity. This approach was found to be far faster than traditional review processes, however it was also quite hard on authors since their work could be publicly rejected. Similarly, open review systems have been discussed and proven successful in practice in the *Synlett*, a chemical-synthesis journal (Anderson, 2006; List, 2017). On the other hand, such open review methods are reportedly undesirable (Greaves, et al., 2006; Ware, 2008).

In addition to reviewer recognition, alternative reviewing methods, and IF, outreach was specifically noted by the questionnaire respondents as a means to improve the publication process (Figure 2b). The respondents did not consider outreach to scientists as important as to archaeologists and historians (Figure 2d). This outlook is somewhat reminiscent of a divide between the sciences and social sciences that took place in the 1990's and 2000's (see Martinón-Torres and Killick, 2015), which spurred the publication of several papers dedicated to highlighting the reciprocal value of outreach between scientists and archaeologists (e.g. Martinón-Torres, 2008; Pollard, 1995; Pollard and Bray, 2007). We fully support increased outreach to scientists, and believe that it is needed more than ever given the continued intermingling of science and archaeology (e.g. Killick and Fenn, 2012; Killick, 2014). Without additional information, it is impossible to ascertain the respondents' viewpoint, but it may suggest that the majority do not believe additional outreach is necessary or that there is no interest by those in the sciences in current archaeometallurgical research. Another possibility, specific to archaeometallurgy, is that some may view the field as having come of age in and of itself (Cleere, 1993), or that in general archaeological science is itself an established science (Killick and Goldberg, 2009); and, perhaps, no longer requires the same degree of interaction with other fields. Ultimately, the meaning behind the questionnaire responses is too vague in this context to draw any conclusions, however it is almost certainly best that one does not become overly isolated in one's own field (e.g. Hayashida, 2003; Killick and Young, 1997; Knapp, 2000; Olin, 1982; Pollard and Bray, 2007; Renfrew, 1992).

Finally, a note on the continuing issue of gender inequality must be mentioned as it was revealed by the questionnaire. A widespread issue in academia, and one that is no less prevalent in the field of archaeometallurgy (Figure 1c), is the imbalance between male and female representation and employment in high-level positions (e.g. Archaeologists of Europe, 2014; Bain and Cummings, 2000; Killick and Goldberg, 2009; Lind, 2006; Winslow and Davis, 2016). While the questionnaire results do not provide ample data for any finite conclusions or rigorous analysis, we nonetheless feel it is necessary to mention this issue.

Publishing suggestions

From the above list, suggestions are given below for the most pressing issues of increased publication and peer review speed. Journals that publish archaeometallurgical content may benefit from instituting one or several of the previously enumerated review methods in accordance with the desires of authors, reviewers, and current review studies research.

As we see it, the successful adaptation of new review methods in archaeometallurgy are best achieved as a homogenization of several approaches and a balance between the needs of authors and time of reviewers and editors. The approach described by Koop and Pöschl (2006) and Boellstorff (2010) [2], whereby a similar two-staged anonymous review process is used, seems to be the most promising since they combine a rapid reviewing technique with traditional expert reviews. Their two-staged approach can also be easily expanded upon to include other methods based on the needs and logistical capabilities of individual journals. For instance, the second stage, following a first stage rapid pre-screening of abstracts and discussion, could include aspects of the methods described by Lahiri (2006) [1], Koonin et al. (2006) [3], or Sandewall (2006) [4], depending on the resources of the journal and availability of reviewers. How-

ever, for the second stage we believe the method outlined in [2] to be best because of its simplicity and adherence to traditional reviewing procedures.

We believe that the most important factor in good reviewing procedures is in finding appropriate and qualified reviewers for the entirety of the process. However, the approach described by Koop and Pöschl (2006) [2] calls for several expert reviewers over the course of the process, which archaeometallurgical journals certainly lack. In general, delayed article reviews in archaeometallurgy are due to a lack of manpower and expertise rather than review procedures. This is a problem that even the most efficiently designed timetable and review methodology cannot overcome. The need for outreach to scientists is therefore especially salient given the growth and diversity of archaeometallurgy outlined previously in this paper. It is also important that the first stage of the review process be a precursor and check of the archaeological and scientific significance of a paper before moving on to the second stage. We encourage the inclusion of scientists in the initial review stage.

Outreach suggestions

Outreach to scientists is particularly important because the steadily increasing application of scientific methods and techniques in archaeology, which have concomitantly grown with the number and length of articles submitted for publication. In order to overcome the dearth of reviewers in archaeometallurgy, more interested scientists must be sought and included in the review process.

In order to achieve this, and in agreement with Killick (2017), scientists must be made aware of the indispensability of archaeology to corroborate scientifically acquired evidence. Conversely, it is equally indispensable for scientists to similarly reach out and communicate with archaeologists. Outreach between the two could take the following forms: 1) more publications by archaeometallurgists in scientific journals; 2) attending and contributing at scientific conferences; 3) including scientists in the reviewing process of archaeometallurgy related publications; 4) immediately reacting to archaeologically unfounded conclusions in papers by posting comments; 5) writing letters to the editor to point out mistakes, and; 6) proactively educating one another by writing summaries of personal research areas of interest. All of these approaches have the benefit of educating and integrating archaeological and scientific knowledge into the review process, while reducing errors in the interpretation of archaeological materials and diminishing the number of low quality publications. Given these recommendations, we suspect the best outreach strategy for all is accomplished by becoming more familiar with other fields and seeking out collaborative work that is built on mutual respect (e.g. Hayashida, 2003; Killick, 2014; Pollard and Bray, 2007). Such collaborative work has a history of proven success in Classical archaeology (Killick and Goldberg, 2009), and should be promoted in all aspects of archaeometallurgy.

Conclusion

The results of an anonymous questionnaire submitted to the ARCH-METALS LISTSERV were consulted to better define the backgrounds of individuals in the archaeometallurgy community. This information showed that the community is highly diverse, containing few specifically trained archaeometallurgists. The respondents were mostly concerned with the slow publication speed of articles in archaeometallurgy, and this issue was addressed in accordance with the desires of the respondents and current suggested and employed reviewing refinements found elsewhere in academia. It was also suggested that social, rather than monetary, incentives for faster turnover of reviews, and/or alternative rewards, can help accelerate publication timetables. We also identified a basic and hybridized review method that could vastly increase publication speed that can be adjusted to implement several review approaches. However, we stress that outreach to scientists is absolutely necessary to implement these improvements in archaeometallurgical journals.

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Notes

1 As of the date of the submission of this article, the first page of papers are being made available online on the Historical Metallurgy website.

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Appendix: QUESTIONNAIRE

(questions indicated with * allow multiple choice answers)

1. Personal information

1.1 sex
female / male

1.2 highest education
Bachelor / MA / PhD

1.3 highest academic rank
none / MA-student / PhD-student / postdoc researcher / lecturer / Prof. / other (additional comments)

1.4 Place of work
Academic / non-academic / retired (academic) / retired (non-academic) / other (additional comments)

1.5 field of degree (MA) *
chemistry / metallurgy / archaeology / archaeometry / material science / none / other (additional comments)

1.6 field of degree (PhD) *
chemistry / metallurgy / archaeology / archaeometry / material science / none / other (additional comments)

1.7 Do you have a permanent position? [This question was added to the questionnaire after the first 47 responses]
Yes / No

2. Professional information

2.1 What metals do you study? *
Please indicate also whether you focus on objects and/or waste materials and (s)melting related objects or none of those.
Iron / steel / copper / arsenical bronze / tin bronze / brass / other copper alloys / precious metals / other (additional comments)

2.2 What is your specialization (analyses)? *
Chemical analyses (SEM-EDXS, XRF, PIXE, NAA, ...) / Metallographic analysis (microscopy, SEM-EDXS, ...) / Texture analyses (ToF-ND, ...) / Isotope analyses (MC-ICP-MS, ...) / other (additional comments)

2.3 What is the type of most of your scientific contributions (1 to 3; with 1 being the most common)?
Case study / general study / basic research / other (additional comments)

3. Publication habits

3.1 – 3.4 In what fields do you publish your book chapters / monographs / journal articles / conference proceedings? *
(1 to 3, with 1 being the most common, and no publication)
Scientific / archaeometry / archaeology / / other (additional comments)

3.5 Is it important for you to publish in journals with (high) impact factors?
Yes / No

3.6 Why?
(additional comments)

3.7 Is it important for you that your publications are listed in Scopus or the web of science (WOS)?
Yes / No

3.8 Is Open Access important to you?
Yes / No

3.9 How do you access publications? *
Library / Online access via research institution / Academia.edu / Researchgate.com / Personal contact with author / Internet platforms such as sci_hub / other (additional comments)

3.10 In which international ARCHAEOMETRY journals have you published archaeometallurgical studies? *
(please add also the names of further journals you published in)
Archaeometry / Archaeosciences / Der Anschnitt / Historical Metallurgy / Journal of Archaeological Science / Journal of Archaeological Science: Reports / Journal of Archaeological and Anthropological Sciences / Mediterranean Archaeology and Archaeometry / STAR: Science & Technology of Archaeological Research / none / other (additional comments)

3.11 In which international SCIENTIFIC journals have you published archaeometallurgical studies? *
(please add also the names of further journals you published in)
Acta Metallurgica et Materialia / JOM / Journal of applied physics / Materials Characterization / Materials Science and Technology / Metallurgical and Materials Transactions (A-E) / PLoS ONE / PNAS / Scientific Reports (Nature) / Scripta Materialia / none / other (additional comments)

3.12 In which international ARCHAEOLOGICAL journals have you published archaeometallurgical studies? *
(please add also the names of further journals you published in)
Antiquity / Journal of Anthropological Archaeology / Journal of Archaeological Method and Theory / none / other (additional comments)

3.13 Are there other journals you can recommend for publishing archaeometallurgical studies?
(additional comments)

4. Being reviewer

4.1 Please indicate if you have ever been a REVIEWER for one of the following journals *
(reviewing archaeometallurgical related articles)
Archaeometry / Archaeosciences / Der Anschnitt / Historical Metallurgy / Journal of Archaeological Science / Journal of Archaeological Science: Reports / Journal of Archaeological and Anthropological Sciences / Mediterranean Archaeology and Archaeometry / STAR: Science & Technology of Archaeological Research / Acta Metallurgica et Materialia / JOM / Journal of applied physics / Materials Characterization / Materials Science and Technology / Metallurgical and Materials Transactions (A-E) / PLoS ONE / PNAS / Scientific Reports (Nature) / Scripta Materialia / Antiquity / Journal of Anthropological Archaeology / Journal of Archaeological Method and Theory / none / other (additional comments)

5. Identity and potential improvements in publications of research in archaeometallurgy

5.1 Do you consider yourself an 'archaeometallurgist'?
Yes / No

5.2 Why, or why not?
(additional comments)

5.3 What improvements could be made in archaeometallurgical journals and related media?
(such as speed of publication, more international journals focussing on specific aspects of archaeometallurgy, ...)
(additional comments)

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