

# Science Gateways and Humanities Is a Promising Partnership: Why Is It So Rare?

Kerk F. Kee

*College of Media and Communication  
Texas Tech University  
Lubbock, TX, USA  
kerk.kee@ttu.edu*

Sandra Gesing

*Discovery Partners Institute  
University of Illinois  
Chicago, IL, USA  
sgesing@uillinois.edu*

Annelie Rugg

*University of California,  
Los Angeles  
Los Angeles, CA, USA  
annelierugg@ucla.edu*

Shannon Bradley

*NCSA  
University of Illinois  
Urbana, IL, USA  
sbrad77@illinois.edu*

Steven R. Brandt

*CCT  
Louisiana State University  
Baton Rouge, LA, USA  
sbrandt@cct.lsu.edu*

Natalie K. Meyers

*Lucy Family Institute  
University of Notre Dame  
Notre Dame, IN, USA  
natalie.meyers@nd.edu*

Quinn Dombrowski

*Div. Literatures, Cultures and Languages  
Stanford University  
Stanford, CA, USA  
qad@stanford.edu*

**Abstract**—Researchers and educators in humanities such as computational linguists, digital humanists, and those doing historical reconstructions are increasingly heavy users of computational and/or data resources. Many know about activities, working groups, and initiatives around the FAIR (Findable, Accessible, Interoperable, Reusable) principles and are a driving force for improving the situation for sharing data and software. However, it seems humanities researchers are less aware of the science gateways community and the end-to-end solutions that science gateways could provide, therefore lacking a driving force for adoption of this technology. Some may be creating their own gateways outside the community; others may wish to use computational and data infrastructures but may perceive a lack of support or opportunities. Hypotheses about the reasons that humanities are not well represented as gateways builders and users include lack of funding and support by computer centers. This study will clarify some of the challenges and needs faced by computational researchers in the humanities that may explain their relatively low participation in the science gateways community. For this paper, we present the results of two interviews as proof of concept for the study. We plan to follow with 12-15 additional interviews for the larger study.

**Index Terms**—science gateways, humanities, community study

## I. INTRODUCTION

The science gateways community is growing in several research domains, a fact which is made evident by the many new attendees every year at the US Gateways conference (Gateways) and the European International Workshop on Science Gateways (IWSG), where about 50% new attendees are present at each event with similar total number of attendees (registration numbers and details are collected by the Science Gateways Community Institute [1]). There is also an increase in the number of citations of science gateways in publications since 2016. The concept of science gateways as a means for providing end-to-end solutions for computational methods and data management seems to align with the rise in the use of computational methods in the humanities, and yet humanities

researchers are poorly represented in the science gateway community. Eighty to ninety percent of attendees at the yearly Gateways and IWSG events are from STEM (Science, Technology, Engineering and Math), with only a small number of researchers from humanities. In comparison, humanists represent a more significant segment of other related areas such as initiatives around FAIR (Findable, Accessible, Interoperable, Reusable) [2]. FAIR is a natural fit for science gateways since gateways are designed to actualize the principles of FAIR by sharing data and software within a community and/or publicly. Even so, this natural fit has not led humanists to discover or otherwise engage in the science gateways community. Some have hypothesized that the low uptake of gateways solutions or even awareness of the gateways community could be due to lack of funding, lack of support from computer centers for humanists, humanities scholars being less tech-savvy, or that humanists feel disintermediated as welcome participants by the moniker “science gateway” itself.

The Gateway Ambassadors – who are community builders and enthusiasts around science gateways – have undertaken a project to investigate the reasons behind the misalignment of, on the one hand, the increase in use of computational and data resources in the humanities and, on the other hand, the absence of meaningful uptake of science gateways solutions. The main purpose of this paper is to explore why there aren’t enough collaborations between humanities scholars and gateway providers, and potential solutions to this matter. As a first step, we developed an interview protocol and defined the scope of the group to be interviewed. Humanities is a wide field of domains and humanities scholarship also involves not only researchers but also librarians and information architects as stakeholders. In interviewing a representative cross-section of these stakeholders, we hope to better understand their particular obstacles and opportunities in the science gateways ecosystem. For this paper, we present the results of two interviews as proof of concept for the study. We plan to follow

up with 12-15 additional interviews, sufficient data for an exploratory study according to [3].

## II. RELATED WORK

One of related work is The Carpentries [4], which teaches “foundational coding and data science skills to researchers worldwide” have developed curricula that have succeeded in bringing technical solutions to humanities and other researchers. The Carpentries concept is to teach in small episodes and with a hands-on approach to ensure that attendees are exposed to a variety of computational platforms. The goal is that new entrants can build confidence in computational tasks, understand the benefit of using various tools, and become part of the Carpentries community for follow-on support and development. Central to The Carpentries model is a train the trainers ethos, which makes the program scalable. By reusing an open curriculum, attendees can advance from learners to trainers of the next cohort. While we are not aware of Carpentries curriculum developed explicitly for science gateways, we know that skills such as familiarity with HPC, use of versioning tools and code repositories, and foundations of scientific software and data management are included, making these and related topics available and accessible to the humanities researchers who participate in The Carpentries. The results of this study may suggest where there are opportunities for new carpentry curriculum topics.

Another area of related work is the NSF-funded Virtual Residency for research facilitators, which is a week-long workshop held annually to build a research facilitator community of practice around topics and best practices that will enable facilitators to work with scholars from a wide range of domains – including the humanities and arts. The topics are especially focused on professional skills and much less on technical skills. The Virtual Residency offers sessions that span introductory, intermediate and advanced topic areas. As a topic in the intermediate-advanced range, Science Gateways fit well into the Virtual Residency curriculum. As with The Carpentries, this study is likely to surface humanities use cases for Science Gateways that would be relevant topics to augment the Virtual Residency curriculum.

Most science gateway providers know that the uptake in the humanities of the science gateway framework is lower than it could be, but the reasons are not fully understood beyond the need for more targeted outreach. It seems clear our study could provide important insights into computational needs in the humanities.

## III. STRUCTURE AND PROTOCOL OF INTERVIEWS

Given that relatively limited prior work has been done at looking at the intersection of science gateways and the humanities, we take the qualitative interviewing approach [5] to explore this emerging topic. The interview protocol includes 10 open-ended questions designed to solicit participants’ professional backgrounds and day-to-day work, experiences with developing and/or using computational tools in the humanities, knowledge of, access to, and/or funding for science gateways,

as well as their opinions about the collaborations (or lack of) between humanities scholars and gateway developers, barriers to and/or enablers of such collaborations, and a wrap up question to allow participants to freely share any other thoughts on the topic of science gateways and the humanities. The design of the interview protocol is intentionally semi-structured, allowing the interviewers to improvise the questions based on the conversation, and for participants to lead the interviewers down their true journeys and experiences. The semi-structure design is best for studying emerging topics, because the researchers’ pre-designed questions may contain assumptions that could be shown to be invalid during the interviews, thus calling for flexible adaptations [6].

Prior to conducting the interviews, the research team obtained an IRB approval on the study (TTU IRB 2022-454), and the research team members conducting the interviews also went through the research ethics training to be IRB certified.

## IV. ANALYSIS

The focus of our analysis is on the themes that surfaced in our interviews related to humanities research, computation, and science gateways. We used Otter.ai, an AI transcription service, to generate a full transcription for the interviews. We then listened to the recorded interviews while analyzing the transcripts concurrently. We followed the grounded theory analysis approach used by Kee and colleagues [7] in a qualitative interviewing study of science gateways. We first used ‘selective coding’ to flag text related to collaboration between humanities scholars and gateway developers. We then used ‘open coding’ to identify, compare and iteratively refine the themes. Finally we used ‘axial coding’ to relate themes to each other in meaningful ways. In this analysis, we have taken a problem-solution approach — first discussing a problem, and then pairing it with a (potential) solution. There are four pairs of problem-solution sets, which we elaborate in the next section.

## V. RESULTS

As a preview, the four problem-solution sets are: (a) Not knowing what gateways are - Improve learning experience, (b) Lack of time - Have funders create incentives, (c) Humanities scholars getting discouraged - Social modeling to inspire humanities scholars, and (d) cultural traditions - introduce gateways without threatening cultural identity.

### A. *Not knowing what gateways are - Improve learning experience*

The first problem stems from the unclear definition and/or fuzzy boundary of what constitutes a “gateway”. Both participants brought up OSF a free, open plat [8] form to support research and collaboration) as a potential example of a gateway, one was certain about it, and the other was unsure. One explains, “And they might not even think of what they do with a gateway as interaction with a gateway. They think of themselves as someone using something on the internet rather than benefiting from a gateway... they might not characterize

or label it in that way” (P01). She continues by explaining that gateways may be a broad and all encompassing concept, “You engage with science gateways at different phases of the research lifecycle... People can use a gateway during the discovery phase of their research. Or they can use a gateway to run models and generate data during the active part of their research, where they can use a gateway to share the outputs of their research so that other researchers can interact with it as software or as data... the place where your individual effort intersects the gateway can be at many different spokes on the wheel. And that’s another reason why people might not always identify that what they’re doing is interacting with the gateway”.

The solution to this problem is improving the learning experience about gateways for humanities scholars, including through education and support from a bridging liaison. A participant explains, “we try to provide onboarding for scholars at any career phase from undergraduate to tenured professor to help them adopt digital approaches that fit their research need... Sometimes that collaboration between the humanities scholar and the gateway provider can only be bridged with education” (P01). Another participant suggested the idea of working with a bridging liaison. She explains, “You need someone who understands both sides of the thing. You need someone with a background in the humanities... do the same on the other side, even if they’re not doing the coding, being able to explain to the people who are sort of things... people in these hybrid roles are there for it to help translate and draw out some of those assumptions and questions...” (P02). She continues by pointing out two important qualities of such bridging liaisons, “finding the right personality type, where you sort of also add in, like, a desire to help other people... make this experience suck less... A lot of people go into this [working as a bridging liaison], because they’re [also] genuinely curious researchers”. The qualities of wanting to help people and genuinely curious themselves would improve the gateway learning experience of humanities scholars.

#### *B. Lack of time - Have funders create incentives*

Participants noted that lack of time is the second important barrier. Humanities scholars often have multiple duties, including teaching and service, in addition to doing scholarship. One participant explains, “Many humanists won’t have time for it because they have so many other deadlines and commitments, often concurrent with [a high] teaching load” (P01). This participant’s point is a high teaching load takes up most of the work time humanities scholars have. Furthermore, the humanities research work that they do (and are comfortable with) is also very time-consuming. Another participant explains, “They’re literally willing to do things manually... And sometimes I actually have to sell them on like – No, really, let me do this for you! – [They] know, they can get it done in a week, if they just like spend all day doing this manually” (P02). Given the existing workload and approach to doing research, many humanities scholars do not have time to learn a new technology, if their current approach still works.

One potential solution to this problem is to create the necessity of collaboration on gateways, perhaps through funders and funding solicitations. A participant explains, “So funders can force collaboration... many of my past gateways projects, that collaboration was funder determined...” (P01). The essence of this solution is to create a situation where humanities scholars are required to use gateways collaborations to receive funding.

#### *C. Humanities scholars getting discouraged - Social modeling to inspire humanities scholars*

One of the problems that humanities scholars face is that gateways developers, who have traditionally worked with scholars in the sciences, lack a ready understanding of, how to develop for the domain-specific needs of humanists, and are caught off-guard by not being able to readily deliver what is needed, and receiving negative feedback from their humanities partners. This discourages humanities scholars from further collaboration. One participant explains where the differences and expectations may have come from by saying, “[P]eople [developers] who have done this kind of support for the sciences, who like to get great feedback from the science scholars, because they’re like – [The] system is amazing, and works exactly the way that [science] people expect – If you’re dealing with developers, who kind of have a successfully functioning system and feel good about their system. And are like – Oh, humanities, that’s probably easy! We’ll just add some features!” (P02). Here this participant describes a situation where their gateway works well with scientists, and they expect that it will easily adapt to humanists.

Then she contrasts developers’ expectations with when they work with humanities scholars, “Everyone’s going to end up frustrated and angry... They [developers] are absolutely going to enrage and befuddle the humanists... [Because] it’s hard for them [the developers] to hear that actually it [their gateway that works perfectly for scientists] doesn’t work at all for this other group of [humanities] people... [Instead of] being able to take that feedback and make changes and listen to the person who’s raising these concerns, rather than just blowing them [humanities scholars] off is like – Well, clearly, it’s the humanists [who] need more training to do things the right way” (P02). So, while the gateway may work really well for the scientists, who are well-acquainted with the computational technologies that gateways afford, the gateway cannot easily be adapted to the humanities.

She continues and explains what would likely happen to the humanities scholars in this situation. She explains, “With a lot of time and effort and frustration and patience on the part of the humanist which often like they just don’t have, they will give up before they tried to do the bridging themselves usually... That’s what they’ll be told that... They [humanities scholars] will quickly conclude they don’t have time for this shit. So they’ll go back to spending a week doing it manually, or like three days running it on their laptop...” (P02).

If humanities scholars can be discouraged in a situation like this, what is a solution then? A possible solution is social modeling. The first participant suggests pairing inspiration and

training during a workshop. The unique aspect of this solution is to “prime” the humanists with inspirational peer successes as social modeling before the hands-on experience that could be discouraging. The second participant also suggests, “It’s really important to have some degree of respect for that from the computational side as well” (P02).

#### *D. Cultural traditions - introduce gateways without threatening cultural identity*

The fourth and last barrier is the misalignment of cultural traditions in the humanities with gateways and collaborative research. Specifically, the humanities traditionally value scholarship done manually, by solo authors, as described by many humanities departments’ tenure and promotion criteria. First, humanities scholars trust their own analysis more than the computer. Second, humanities scholars are not trained traditionally (in terms of curriculum) to use computer analysis. In fact, a participant states that “And it’s [i.e., computer analysis] one that is often viewed with skepticism by your colleagues, who also don’t trust the computers... They [Question] the legitimacy of your results anyways, and like – Why didn’t you just like read three books with your eyeballs and comment on them like normal people? – So it’s a lot easier for people to do things the traditional way” (P02).

The second important aspect of the cultural tradition is that the Digital Humanities, which is the most active area of humanities computation, is not gaining traction in the broader humanities community. The same participant continues, “The problem is that what we have been seeing has not really yielded the results that people had hoped for. These papers are not getting cited. ... It’s, it’s sort of like, you know, there’s interesting things happening within like this sort of small sub community’s sphere, but it’s not really having an impact on the broader discourse of literature. And that’s depressing, that you do all this work, hoping to push the field forward. And the field says – No, thank you!” (P02).

The third important aspect of the humanities cultural traditions negatively impacting uptake of gateways solutions is the risk a humanist takes in one’s career when pursuing computational work. The same participant elaborates, “There are so few tenured professors who do this, like, literally, I can count them on one hand... There are not a ton of jobs out there for doing this kind of thing... It’s not even just a matter of not getting invited to the parties. If you would like to continue to be employed in this field, that’s how you get a job, that’s how you keep your job... You have to have your book, you have to have your number of articles, like you’re expected to engage as if you were doing traditional work... And then whatever computational things you’re doing on the side... whatever sort of, like time consuming hobby you have is like your own problem” (P02).

She concludes this explanation with a very powerful reflection, “I think there’s actually been times that I have had these sort of moral crises when it comes to my job. There was one time a junior faculty... she got her mid tenure process review letter. And the message was very clear that like she

needed to stop doing DH stuff, because it was detracting from her traditional scholarship... I felt like incredibly morally compromised, that like my job, which they were paying for, might actually screw her over and make it so that she would lose her job. It’s just a terrible position to be in as staff to realize that like you might be screwing over your collaborators by working with them.”! This is a powerful observation, and one that we take to heart in this study. While this paper was started with the intention to promote gateways to the humanities, we must account for the unintended consequences of promoting innovations.

Such strong cultural traditions that humanists must work with require a thoughtful approach that works from within that tradition so as not to jeopardize careers.

## VI. OUTLOOK

This paper describes a preliminary study by the Gateway Ambassadors seeking to understand more about humanities scholars’ computational needs and their low awareness and use of science gateways. Building on the success of our initial two interviews, we will analyze the results of 12-15 additional interviews, to include librarians and information architects contributing to humanities research using computational methods.. Our goal is to elucidate the reasons why humanists use or do not use science gateways as part of their research practices. We will also offer suggestions on ways to tailor the solutions and/or adapt the community around science gateways to help humanists realize the potential of science gateways and the science gateways community for their work.

## ACKNOWLEDGMENT

We would like to acknowledge NSF OAC 1547611 (SGCI).

## REFERENCES

- [1] S. Gensing, N. Wilkins-Diehr, M. Dahan, K. A. Lawrence, M. G. Zentner, M. E. Pierce, L. Hayden, and S. Marru, “Science gateways: The long road to the birth of an institute,” in *50th Hawaii International Conference on System Sciences, HICSS 2017, Hilton Waikoloa Village, Hawaii, USA, January 4-7, 2017*, T. Bui, Ed. ScholarSpace / AIS Electronic Library (AISeL), 2017, pp. 1–10. [Online]. Available: <http://hdl.handle.net/10125/41919>
- [2] M. D. Wilkinson, M. Dumontier, I. J. Aalbersberg, G. Appleton, M. Axton, A. Baak, N. Blomberg, J.-W. Boiten, L. B. da Silva Santos, P. E. Bourne *et al.*, “The fair guiding principles for scientific data management and stewardship,” *Scientific data*, vol. 3, no. 1, pp. 1–9, 2016.
- [3] G. Guest, A. Bunce, and L. Johnson, “How many interviews are enough?: An experiment with data saturation and variability,” *Field Methods*, vol. 18, no. 1, pp. 59–82, 2006. [Online]. Available: <https://doi.org/10.1177/1525822X05279903>
- [4] “The carpentries.”
- [5] K. F. Kee and A. R. Schrock, “Telephone interviewing as a qualitative methodology for researching cyberinfrastructure and virtual organizations,” *Second international handbook of internet research*, pp. 351–365, 2019.
- [6] K. F. Kee and M. Thompson-Hayes, “Conducting effective interviews about virtual work: Gathering and analyzing data using a grounded theory approach,” in *Virtual work and human interaction research*. IGI Global, 2012, pp. 192–212.
- [7] K. F. Kee, A. Olshansky, and S. Xu, “A socio-technical framework for measuring organizational capacity during cyberinfrastructure diffusion,” in *2021 IEEE International Conference on Big Data (Big Data)*. IEEE, 2021, pp. 2301–2305.
- [8] “<https://osf.io>: The place to share your research.”