

5 Empowering global engagement

The development of digital humanities research and pedagogy at UCL¹

*Jin Gao, Adam Crymble, Simon Mahony,
Steven Gray and Claire Warwick*

1 Introduction

The discipline now known as Digital Humanities (DH) has origins in several different fields. The most well-known story is its origin in linguistics and English studies, where the use of computational techniques and methodologies in the humanities is usually linked to the work of Roberto Busa from the 1940s, and the work of Josephine Miles, although far less known (Miles, 1946; Busa, 1950). Many in the field look to Busa as its progenitor, through his collaboration with IBM and his creation of an *index variorum* of the combined works of Thomas Aquinas. Yet, alternative foundation narratives also exist, both in linguistics and in other disciplines such as history, which place emphasis on other key moments that better reflect issues like disciplinary differences and the key projects that inspired much of the work we now celebrate (Rockwell, 2007; Nyhan & Flinn, 2016a; Crymble, 2021). Indeed, some argue that DH as a field only emerged at the beginning of the 2000s (Berry & Fagerjord, 2017, p. 10), while others claim that it started in the 19th century (Brandeis Library, 2013; Hayes, 2017). Whichever view we take, the history of DH is gaining increasing traction (Nyhan, 2023), and DH itself has grown out of earlier movements within scholarship, which can be traced in the Anglophone sphere through the changing nomenclature: “applied computing in the humanities”, to “humanities computing”, and then to “digital humanities” (Mahony & Gao, 2019). Nyhan and Flinn argue that this history ‘once neglected, is now emerging and is absolutely necessary’ (Nyhan & Flinn, 2016a, p. 14). This chapter seeks to contribute to the broad conversation about the history of DH that has opened up in the last decade (Crymble, 2021; Kemman, 2021).

Within that conversation, various treatments of DH at the national level have emerged, e.g., the Netherlands (Zaagsma, 2013), Germany (Thaller, 2017), and France (Le Deuff, 2018). Why zoom in further, to write institutional histories of DH, such as that set out here? Institutional histories can play an important role in acknowledging and addressing the “role of difference” within the knowledge production enterprise (Jones, 2013, p. 31). Recognising the significance of diversity in terms of gender, race, geo-linguistic background, and intersectionality, DH scholars and organisations are increasingly focalising the need for inclusive representation and community diversity (Bailey, 2011; Gil & Ortega, 2016; Liu, 2018; Mahony,

2018; Risam, 2015). In recent years, there has been a growing recognition of the need to move beyond traditional Anglophone and male-dominated perspectives, to embrace a more inclusive and representative DH landscape (ADHO, 2022; Estill et al., 2022; Gao et al., 2022; Nyhan, 2023). These efforts have sought to dismantle historical hierarchies, disrupt exclusionary practices, and amplify marginalised voices within the DH community.

Thus, understanding the historical trajectory of DH at institutions like University College London (UCL) through retrospective studies, such as the one presented in this chapter, is a necessary part of the wider whole. Though presenting a necessarily partial view, the institutional view is one that can be profitably co-joined, or indeed contrasted, with other available historical lenses, such as the history of digital technology in DH. By delving into institutional pasts, we can gain not only a better understanding of “who we are” and “where we have come from” as a community, and at a high level of local resolution, but also gain valuable insights that may be applicable to the challenges and opportunities that lie ahead for DH at UCL and comparable institutions. Ideally, then, the lessons learnt from institutional histories might enable us to build upon existing strengths, confront past inequalities, and effectively address the evolving needs of the DH field, and the multiplicity of actors and agents that constitute it, at individual, institutional, national, trans-national, and global levels. The limitations of institutional histories written, as this one is, by those who participated in the events at hand should be acknowledged too, and this chapter does lay an emphasis on successful events, and milestones, in a way that a more critical outsider, less hindered by institutional politics and ongoing professional relationships may not (Chowdhury, 2013). We acknowledge that as a world-leading and well-funded university, the discussion presented in this chapter is of a variant of DH that could only be pursued in highly privileged circumstances.

In the following sections, we present discussions that explore the development of DH at UCL (Section 2), the co-authorship networks at UCL (Section 3), DH pedagogy (Section 4), the widening of engagement (Section 5), and conclude with the key insights gained from these investigations.

2 The DH development at UCL

2.1 The early works (1970–1994)

University College London (UCL), founded in 1826, holds a significant place in the history of higher education for its progressive stance on gender equality. In 1878, UCL became the first university in the UK to admit women on equal terms with men, demonstrating its pioneering role in promoting gender inclusivity in academia. This early commitment to coeducation contributed to UCL’s reputation as a leader in advancing educational opportunities for women and fostering a more inclusive and equitable learning environment. Over the years, UCL has emerged as an important institution in the global field of DH with innovative research, teaching, and interdisciplinary collaborations. At UCL, the most well-known DH

milestone was probably the establishment of UCL Centre for Digital Humanities (UCLDH), formally launched in 2010, but active from 2009 onwards. At the same time, other research centres and departments at UCL were also actively engaged with DH work, e.g., the UCL Centre for Advanced Spatial Analysis (CASA); the UCL Interaction Centre (UCLIC); the UCL International Centre for Chinese Heritage and Archaeology (ICCHA); the UCL Centre for Medical Image Computing (CMIC), and more. Some examples will follow later in this chapter. UCLDH did not seek to ‘own’ or control DH activities at UCL but rather to provide a central hub to facilitate exchange and coordination, cooperation, and collaboration (Warwick et al., 2011). For a significant time before the foundation of these centres, UCL scholars had been making substantial contributions in the relevant fields and participating at related events.

UCL’s role in the development and application of computational techniques and methodologies to the Humanities can be traced to the 1970s at least. This early phase was driven by pioneering scholars in computational linguistics (e.g., Arthur Colin Day, David W. Packard), Geographic Information System (GIS) (e.g., Roger Tomlinson), who built a global network of collaborators (e.g., Sidney Greenbaum, Andrew Rosta).

According to the Index of DH Conferences (Weingart et al., 2023),² the first UCL scholar to present at a major DH conference was Arthur Colin Day in March 1970. He presented at the ALLC/EADH (Association for Literary and Linguistic Computing) *Symposium on the Uses of Computers in Literary Research*, hosted by Cambridge University (23–26 March 1970). There, Day presented the paper *FORTRAN as a language for linguists* with the affiliation of ‘Computer Centre – University College London’ (Farrington, 1970; Nyhan & Flinn, 2016b, p. 237). This symposium is one of two early conferences held by the ALLC before its formal inauguration in 1973 and its first so-titled conference in 1974. This association later changed its name to the European Association for Digital Humanities (EADH) and continues to be a co-host of a major, annual international DH conference (EADH, 2023a).

Day was awarded his PhD in General Linguistics in 1966 from the School of Oriental and African Studies (SOAS), University of London, and he worked at the UCL Computer Centre from 1967 to 1992, starting as a programmer and later promoted to the Head of Applications (Day, 2004). According to his biography, after giving a talk to the School of Library, Archive and Information Studies (now, the UCL Department of Information Studies, UCLDIS) on how computers could be used for non-numerical work, the then Head of Department suggested that he write a book about it, which resulted in the *Fortran Techniques, with Special Reference to Non-numerical Applications* (Day, 1972b).

This book quickly became ‘the one to have’ for studying and applying the Fortran programming language and it sold tens of thousands of copies (Barron, 1973). Day started to run the Fortran course for “all-comers” at UCL, and later this popular course was videotaped and published by Athlone Press, with the title *A London Fortran Course* (Day, 1972a). Day also actively contributed to the review of the COCOA (COunt and COncordance Generation on Atlas) project (Russell,

1965), which was a concordance programme developed by UCL and the Atlas Computer Laboratory. Following this, he published the article *Software Reviews: COCOA: A Word Count and Concordance Generator* in the journal *Computers and the Humanities (CHum)* with Ian Marriott, who was doing his PhD in Latin at UCL, and they became the first UCL scholars to publish in what many consider to have been one of the canonical DH journals – *Computers and the Humanities* (Day & Marriott, 1976). COCOA played a significant role in the emergence of digital humanities (then known as applied computing in the humanities), offering word-counting and concordance-building functionalities. While successor formats like TEI XML gained wider adoption, COCOA’s legacy and influence remain noteworthy (Hockey, 2004).

While discussing COCOA and the Atlas Computer Laboratory, one key person who was related to these early works and who also presented at the same 1970 Cambridge symposium was Susan Hockey (Hardesty & Mann, 1973). Although a much more well-known scholar to the UCL DH community, she was not affiliated with UCL until 2000 (EADH, 2023b). At the 1970 symposium, together with Robert F. Churchhouse from Cardiff University, Hockey presented their research *The use of an SC4020 for output of a concordance program* under her pre-marriage name of ‘Miss S. M. Petty’ with her affiliation as ‘the Atlas Computer Laboratory’ (Farrington, 1970, p. 315; Nyhan & Flinn, 2016c, p. 87).

Hockey played a crucial role as a founding member of the ALLC in 1973 and she joined the Oxford University Computing Services in 1975. Her first formal association with UCL is recorded in the *Index* as her presentation at the ACH/ALLC 1999 conference in Virginia, when she was listed as one of the ten authors of *Can a Team Tag Consistently? Experiences on the Orlando Project* (Butler et al., 1999). In 2000, Hockey joined UCL as Professor of Library and Information Studies, and later became the director of the School of Library, Archive, and Information Studies (now UCLDIS) from 2001. Upon her retirement in 2004, she was awarded the Roberto Busa Prize by ADHO (the Alliance of Digital Humanities Organizations), recognising her as a leader in the field of humanities computing (EADH, 2023b). Later, to celebrate the fifth anniversary of UCLDH in 2015, Hockey gave the inaugural lecture in what became the annual Susan Hockey Lecture at UCLDIS, commemorating her contributions to the field.

Roger Tomlinson, widely recognised as the “Father of GIS” completing his PhD at the UCL Department of Geography in 1974 (Tomlinson, 1974). He went on to pursue innovative work in digital mapping, a legacy that endures today in the fundamental principles underlying modern computer-generated cartography. It was during his time at UCL that Tomlinson laid the groundwork for the *Canada Geographic Information System*, influential in the field of geographical information science to this day. Tomlinson’s dissertation, titled *Geographical Information Systems, Spatial Data Analysis, and Decision Making in Government*, remains relevant with his forward-looking perspective on the flow and types of spatial data elements, their governance and impact on the real world (Cheshire, 2017). Tomlinson’s groundbreaking maps, developed during his time at UCL, were among the earliest to demonstrate the value of integrating spatial data for insightful analysis,

which exemplified their potential for identifying land areas with favourable prospects for specific land uses, based on a set of prioritised criteria.

Apart from the key projects and efforts mentioned, growing scholarly collaborations and exchanges across different countries and regions can also be detected during this early time. After the foundation of ALLC in 1973, the first two official ALLC conferences were held at Cardiff University in April 1974 (Jones & Churchhouse, 1976) and at King's College London in December 1974 (Butler, 1974). Looking through the two proceedings, along with Day and Hockey, many DH pioneers also attended the conference, e.g., Roberto Busa, Andrew Morton, Roy Wisbey, and Joseph Raben. One attendee who recorded a UCL affiliation was David W. Packard, a former professor of Greek and Latin at the University of California, Los Angeles (UCLA) (Kenneth, 2016). He gained his PhD in classical philology from Harvard University and taught Classics at UCLA and other universities in the USA. There are no recorded ties for Packard with UCL apart from these proceedings. Through personal correspondence with the authors, Packard confirmed that he was a visiting professor, and active member of the research community at UCL in 1974–1975. For example, he discussed his own system for the automatic morphological analysis of ancient Greek titled *Metrical and Grammatical Patterns in the Greek Hexameter* at the 1974 ALLC conference in Cardiff, and he introduced his scheme for using computers in the teaching of ancient Greek at the 1974 conference at King's College London (Butler, 1974; Jones & Churchhouse, 1976). Packard is currently the president of the Packard Humanities Institute, and he is also the son of Hewlett-Packard (HP)'s co-founder David Packard.

This time also saw UCL collaborations at a wider international scale. The International Corpus of English (ICE) founded by Sidney Greenbaum at UCL in 1988 is a large-scale corpus linguistics project that aims to collect, analyse, and compare written and spoken English from different countries and regions around the world (The ICE, 2021). The project's primary goal is to provide a comprehensive and representative sample of global English usage, which considers the linguistic variations and differences that exist among different English-speaking communities, including the United States, Canada, Australia, New Zealand, South Africa, and several other regions where English is a dominant or significant language, such as India and Nigeria. This project was established on the success of the Survey of English Usage (SEU) project, founded by Randolph Quirk in 1959 at UCL, which collected and analysed written and spoken English from Great Britain from 1955 to 1985, creating a substantial and influential corpus of British English, which served as a model and inspiration for the later ICE project.

Many well-known scholars worldwide took part in the development of SEU and ICE projects, which compiled a million-word corpus of their respective English variety, and it had a common design and annotation scheme for comparability (UCL, 2022). The two projects have very close connections, which demonstrated not only a clear academic genealogy with scholars at UCL, but also an expanding global network with significant international impact. The ICE project lead, Greenbaum, completed his PhD at UCL within the SEU project under Quirk's supervision in 1967. Greenbaum succeeded Quirk as the Quain Professor of English Language

and Literature, as well as director of the SEU at UCL in 1981. From 1986 to 1988, Greenbaum served as the Dean of the Faculty of Arts and Humanities at UCL, and supervised many PhD students including Andrew Rosta, who presented the ICE project at the 1992 ALLC conference. Rosta continued Greenbaum's work and joined the SEU project in 1987. Although ICE is not affiliated with UCLDH, through Rosta's email correspondence with us, he communicated his belief that his time at UCL saw the beginnings of the field now known as DH, and he also witnessed the forming of the ICE project's global collaborative network spanning Singapore, South Africa, New Zealand, India, Nigeria, Pakistan, Jamaica, Kenya, and beyond. When working at the ICE project, Rosta took the responsibility for developing the markup scheme which led to him joining the Text Encoding Initiative (TEI) Council as part of a four-person working group on the encoding of spoken texts, along with Jane Edwards (University of California at Berkeley), Stig Johansson (University of Oslo), and Lou Burnard (Oxford University).

2.2 *The structural development (from 1995)*

From this initial take-up of computational techniques and methodologies by individual scholars and research projects, by the 1990s DH appears to have gained structural foothold at UCL, as evidenced by the establishment of many DH-related research centres and projects across different departments and faculties. Additionally, the wider context of the evolving digital and communication landscape driven by the Internet and the general adoption of computational applications also contributed to this expansion, which, in turn, helped foster greater collaboration and international engagement between UCL and the wider world.

UCL's expertise in the spatial realm was fostered by the Centre for Advanced Spatial Analysis (CASA) founded in 1995 within the Bartlett Faculty of the Built Environment at UCL. Led by Michael Batty as the first centre director, CASA aimed to pioneer the advancement of comprehensive urban science by leveraging techniques in modelling, urban environment sensing, visualisation, and computation (Shiode et al., 1998). It was the first among UK universities to employ virtual reality (VR) systems for studying multi-user GIS for London and creating a virtual world in which users as avatars could manipulate urban designs (Batty et al., 1998). Over the years, CASA and the Bartlett Faculty have made their contributions to the field through pioneering projects and collaborations around the world, e.g., Africa Centre/I-Sense project (Manley et al., 2016), GNOMEs project (Milton et al., 2018), Harmony project (Batty & Evans, 2022), City of Women project (Watson et al., 2022). CASA also has close research overlap and connections with DH. Apart from similar research topics and methods, such as feminist studies (Sheppard et al., 2023) and relevant history studies (Cheshire, 2017), scholars in CASA and the Bartlett have collaborated on projects with UCLDH, such as QRator (Hudson-Smith et al., 2012), Textal (Terras et al., 2013), NFTs (Non-Fungible Tokens) related research (Valeonti et al., 2021), and high-performance computing on digitised collections (Terras et al., 2018), and have also jointly supervised PhD research.

The field of Human-Computer Interaction (HCI) is also relevant to research in DH, and the foundation of the UCL Interaction Centre (UCLIC) in 2001 represented another DH milestone at UCL. The centre sits between the Department of Computer Science and the Psychology and Language Sciences Division at UCL. While its roots lie in cognitive psychology, ergonomics, and computer science, under the directorships of Harold Thimbleby, Ann Blandford (from 2004), and Yvonne Rogers (from 2011), its research later embraced the design and social dimensions of HCI, and physical computing (Blandford, 2011; Harrison & Rogers, 2013). Researchers from UCLIC collaborated with UCL Information Studies, before UCLDH was established, on topics including digital libraries (Buchanan et al., 2006) and information-seeking behaviour (Makri & Warwick, 2010). UCLIC is now a globally recognised hub for HCI, and its collaborations extend widely through projects such as the EnTimeMent project, which involves a number of institutions and industries across Europe (Ceccaldi et al., 2020), and the Global Disability Innovation (GDI) Hub, which operates in 61 countries and is the world's first and only WHO Collaborating Centre for Assistive Technology (Holloway & Barbareschi, 2021).

Medical Physics and Computer Vision may seem distant from core DH interests but specialist imaging, such as at the UCL Computer Science Department, the Centre for Doctoral Training in Computer Vision, the Centre of Science and Engineering in Arts, Heritage and Archaeology (SEAHA), and the UCL Centre for Medical Image Computing (CMIC), play important parts in DH research practices at UCL. Collaborations for both research and teaching have resulted in projects such as The Great Parchment Book of the Honourable the Irish Society led by Tim Weyrich and Melissa Terras (Pal et al., 2016), general heritage and manuscript imaging (Giacometti et al., 2014), and a collaborative doctoral project on multi-spectral images of parchment (Giacometti, 2014). Imaging techniques and expertise at UCL have been central to the development and success of the UCL Multi-Modal Digitisation Suite which is coordinated by UCLDH and located in UCL Library Services, Special Collections archival space.

UCL's connection with the development of Chinese DH has been long established through the UCL Institute of Archaeology (IoA) and the International Centre for Chinese Heritage and Archaeology (ICCHA) (Fuller & Pang, 2015). ICCHA was established in 2003 as a collaborative research centre between UCL IoA and the School for Archaeology and Museology of Peking University. The centre is dedicated to the study and preservation of China's rich cultural heritage, with a particular focus on integrating DH techniques and building collaborations beyond the UK and China. For example, the Central Asian Archaeological Landscapes (CAAL) project (Nebbia et al., 2021), launched by UCL IoA and led by Tim Williams, has been digitising and digitally preserving the intricate archaeological legacy spanning Central Asia from the Caspian Sea to Western China. Collaborating with institutions from Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan, Uzbekistan, and China's Xinjiang Uyghur Autonomous Region, as well as involving the International Institute for Central Asian Studies and the ICOMOS International Conservation Centre Xi'an, China, CAAL unites a multinational and multidisciplinary team. This team is entrusted with digitising existing archival materials and

integrating information from regional entities into a unified multilingual repository. The project's holistic approach blends advanced imaging techniques with on-site exploration to uncover new sites, enrich documentation, encourage scholarly engagement, and facilitate informed conservation policies. The CAAL project also employs the open-source ARCHES inventory package, co-developed by the Getty Conservation Institute and the World Monuments Fund, to comprehensively catalogue and manage the diverse archaeological heritage dispersed throughout Central Asia (CAAL, 2019).

Other ICCHA digital humanities projects include the Early Rice project, which pursues linked research on the origins and early development of rice cultivation, as well as the spread of agriculture across China; the Terracotta Army project, which collaborates with the Museum of Emperor Qin Shihuang's Mausoleum and investigates craft specialisation, interactions, and social cohesion in the emerging imperial systems. These project not only facilitate research but also contribute to the interdisciplinary approach, combining archaeology, history, and digital methodologies to understand the cultural exchange in China and other relevant countries. Through its engagement in these projects, IoA and ICCHA have significantly contributed to China's digital cultural heritage as key players in the global efforts to study and protect cultural treasures.

2.3 *The UCL Centre for Digital Humanities (UCLDH) (from 2010)*

The UCL Centre for Digital Humanities (UCLDH) was established in 2010 by a group of scholars including Claire Warwick and Melissa Terras, aiming to form a vibrant interdisciplinary research hub dedicated to exploring the intersection of digital technology and the humanities (Warwick et al., 2011). The UCL Grand Challenges were launched in 2008 (UCL, 2008a), with the aim of fostering interdisciplinary research, an approach to which DH's collaborative working methods were ideally suited. After a successful application to the Provost's Strategic Development fund, in 2009, UCLDH was granted funding for two years, which allowed for a high-profile launch with much media coverage and, more importantly, additional new staff to be hired for teaching, administration, and project work. With support from the Faculties of Engineering, most particularly Computer Science, and the Arts and Humanities, the centre grew and since 2021 is now a part of the UCL Institute of Advanced Studies.

Before the founding of UCLDH, Warwick and Terras had already worked at UCL for several years, having been appointed as lecturers in Electronic Communication and Publishing in 2002 and in 2003, respectively. They taught on, and successively directed, the MA in Electronic Communication and Publishing, which had been established in the late 1990s. This included modules on topics of immediate relevance to DH, such as XML, Internet Technologies, and Digital Resources in the Humanities. This work, combined with their joint efforts in securing grant funding, from Jisc, RIN, EPSRC, and AHRC, demonstrated their commitment to building a strong foundation in digital humanities at UCL. Their work on projects like LAIRAH (UCL, 2005) and VERA (UCL, 2008b) was evidence of the growth

of the field and made the establishment of UCLDH a logical progression. However, it is important to note that their journey was not without challenges: as Terras emphasised with us through personal correspondence, their successes were achieved in spite of adversity. As Kirschenbaum found, in the 2010s, the development of DH was not always welcomed by more traditional humanities scholars (Kirschenbaum, 2014), and UCL was not immune to such attitudes.

In addition to the publication of conference papers and journal articles, which we discuss below, members of UCLDH also collaborated on the publication of books which were significant in demonstrating the breadth of the UCL impact on the digital humanities landscape. *Digital Humanities in Practice*, edited by Warwick, Terras, and Nyhan, with chapters and case studies authored by numerous UCLDH members, presented the works of the Centre, both in terms of research and teaching. *Defining Digital Humanities: A Reader*, edited by Terras, Nyhan, and Vanhoutte (an affiliate member of UCLDH) has become an essential reference for anyone wishing to understand the theoretical foundations of the field.

As above, UCLDH did not plan to take ownership of the many DH activities across the college but acted as a central hub to bring people together to share experiences and expertise. Part of this sharing was to run a series of public events and seminars with speakers from across UCL and beyond; this included the Susan Hockey Lecture in Digital Humanities from 2015 to celebrate the fifth anniversary and continued success of the centre. This was the first, and as far as the authors are aware the only, named lecture series in DH. This outreach also placed UCL firmly within the wider DH context as London had by then become a significant point of DH focus, with our close neighbours at the Department of Digital Humanities, King's College London, and the School of Advanced Study, University of London, to further develop collaboration and the community aspect of our work. In addition to departments and faculty across UCL, from its foundation onwards, the centre has collaborated and worked closely with UCL Museums and Collections (now UCL Culture), UCL Library, and particularly UCL Library Services including Special Collections, one of the foremost university collections of rare books and manuscripts in the UK. Building on these connections, Terras, together with support from Computer Science, developed the multi-modal digitisation suite which is used for teaching and significant research into non-destructive and heritage imaging of bespoke and high value research objects.

UCLDH has members across all parts of UCL, but, nevertheless, there is no building, no dedicated office space, no sign over a door saying, "Digital Humanities Centre". UCLDH is a virtual centre; it is made up of people and hence "People" is the uppermost link on the home webpage menu. The structure has changed over the years. On launch, there was Claire Warwick as Director and Melissa Terras as Deputy Director (both at UCLDIS), Tim Weyrich (Department of Computer Science) and Ulrich Tiedau (Department of Dutch) as Associate Directors, and a small immediate team who invited colleagues and DH practitioners to come together as part of the centre's wider team and affiliates. With the subsequent growth and increase in activities, a more robust management structure developed leading to the one in place today. There is now a management team with director, deputy

and associate directors as dictated by the centres' constitution. The website lists the extensive UCLDH Team with members across the wide range of UCL Faculties, Honorary Members listing the former directors, Affiliated PhD students, and other UCLDH Affiliates. In addition to this, there is the UCLDH Industry Advisory Panel with the centre's major contacts and partners in industry, such as the British Library, the V&A, IBM, Adobe, and Microsoft. One group not publicly displayed is the UCLDH Steering Committee which consists of the deans and representatives from the faculties and departments that work closely with UCLDH and who act in an advisory capacity for strategic and tactical planning. It is this committee that formally appoints the directors and ratifies any changes to the constitution.

UCLDH is unique within the usual university structures. Initially it was situated within UCLDIS and thus the Faculty of Humanities. However, as the centre continued to develop, it became clear that, to better foster interdisciplinary collaboration, a new organisational model was required. In 2013, therefore, it was agreed that the centre should be situated between faculties, so that no one faculty could lay claim to represent DH within the institution. The inaugural and three subsequent directors of UCLDH, Claire Warwick, Melissa Terras, Simon Mahony, and Julianne Nyhan, have all been staff members at DIS, while the current director, Steven Gray, is based at CASA, and Tim Weyrich, one of the first two associate directors is based in Computer Science, which shows this cross-faculty-led structure of the centre. However, the centre is closely linked with the Department of Information Studies (DIS) through research and teaching. The teaching programme was always planned as part of UCLDH but due to various institutional structures and rationale, the programme is owned and offered by DIS. The department offers both Master of Arts and Master of Science degrees in DH as well as a full range of other options such as Short Courses, Diplomas and Certificates, Master of Research, and full MPhil/PhD study. The master's programme has a strong emphasis on cultural heritage and the application of innovative digital methods to the study of the humanities more widely. The students develop strong technical as well as theoretical and critical skills. Whenever appropriate we involve the students in the centre and, where possible, in our research too; this is covered more broadly below.

Overall, UCLDH has played an important role in advancing the DH field, and fostered many projects that span diverse areas within humanities research, digital methodologies, and cultural heritage preservation. Many innovative projects are listed on the centre's website notable for its distinctive graphic design by Rudolf Ammann, produced when he was a PhD student at DIS. The research page features award-winning projects such as the Great Parchment Book, QRator, and Transcribe Bentham. It also highlights notable collaborations between the UCL Digitisation Suite and UCL Library Services and Special Collections.

Faculty affiliated with UCLDH have published books and articles that are highly cited by the wider field, e.g., (Warwick et al., 2012; Terras et al., 2013; Nyhan & Flinn, 2016a). In the third section of this chapter, therefore, we present a co-authorship network analysis, to allow us to further investigate UCL's collaborative engagement in the field of digital humanities. This complements our background study in the earlier section and enhances our understanding of this

historical context. By looking through the collaborations at UCL from a quantitative perspective, we can identify prominent individuals, influential collaborations, and notable patterns of UCL scholarly exchange.

3 The co-authorship networks at UCL

Various methods have been employed to study the development of DH and its communities, such as comprehensive literature reviews (McCarty, 2003), interviews and oral histories (Nyhan & Flinn, 2016a; Nyhan & Passarotti, 2019), statistical and infographic analyses (Terras, 2012; Nyhan & Duke-Williams, 2014), bibliometric analyses (Wang & Inaba, 2009; Weingart & Eichmann-Kalwara, 2017), and social network analyses (Grandjean, 2016; Gao et al., 2017). Among these methodologies, co-authorship network visualisation has emerged as a valuable tool for helping comprehend the collaborative dynamics and scholarly influences within the field (Gao et al., 2022).

This section presents a quantitative exploration of the collaboration networks formed by scholars affiliated with UCL who participated in DH and proto-DH conferences from 1970 to 2023. Through the use of co-authorship network analysis, we offer a distinct lens for examining the intellectual and collaborative history of digital humanities at UCL.

Data has been collected from the Index of DH Conferences for the years 1970–2023; note that this index is a growing record constructed entirely by volunteers and so cannot be considered complete (Weingart et al., 2023). The ADHO conference seems to be fully ingested, but many others are not (for example, ALLC, EADH, DHC are included, and at the time of writing in 2023, up until 2018). Consequently, this does not represent the entirety of UCL’s (or any other institutional) representation at DH conferences during this period. Nor does it include DH contributions to discipline-specific conferences not led by DH organisations. We also acknowledge the lack of inclusiveness and diversity of topics and scholars among DH conference proceedings. Nevertheless, this dataset provides a useful snapshot of participation in conferences between 1970 and 2023, and so is used as the basis for the network analysis in this study.

In general, it seems that DH at UCL has taken the lead in significant areas – one of which is in the number of co-authored conference papers, and another is the number of female scholars when compared to other UK universities with prominent DH contingents during the same period, such as King’s College London (KCL) and the University of Cambridge, UK.

In total, UCL scholars presented 97 papers at DH conferences held between 1970 and 2023 and included in this dataset: 77 were co-authored papers and 20 were single-authored. The multi-authored papers account for 79% of the total from UCL; in comparison, during the same period, 65% of papers by KCL scholars were multi-authored and 47% of University of Cambridge scholars. Figure 5.1 shows the number of single-authored and multi-authored papers presented by UCL scholars each year at DH conferences based on the data held in the Index of DH Conferences (Weingart et al., 2023).

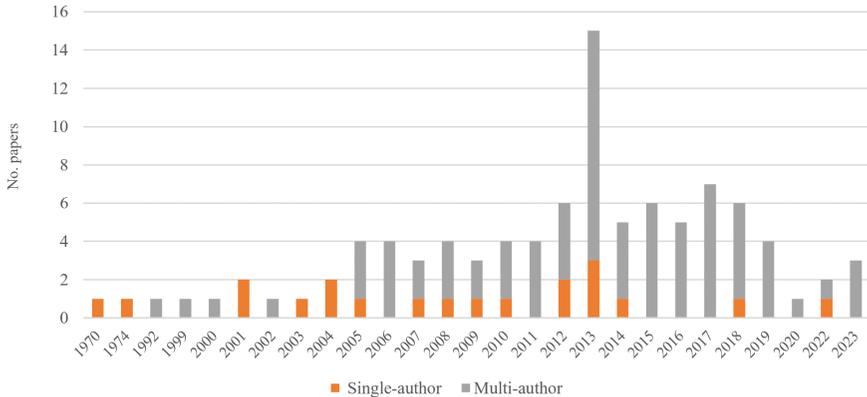


Figure 5.1 The number of single-authored and multi-authored papers presented by UCL scholars each year at DH conferences, data from (Weingart et al., 2023) 1970 to 2023.

There are many aspects to unpack and compare, but our research here mainly focuses on investigating the collaborative network of UCL scholars. Additionally, when counting scholars' affiliations, we are aware that there are many cases where scholars move and change institutions, but we count only the papers where author(s) declare an affiliation with UCL.

We can see from Figure 5.1 that there is overall growth in the total numbers of papers and multi-authored papers at UCL, peaking in 2013 (a clear anomaly that may have resulted from the relaxation of restrictions on the travel budgets that followed the banking crisis). From 2014 to 2019, the number of papers given by UCL scholars remained similar to 2012, while the number of multi-authored papers increased. After 2019, the impact of the pandemic on individual staff members with caring responsibilities, the scholars moving to other universities, or indeed the changing conference locations and their move online in response to the global pandemic might have influenced the numbers. Staff mobility is likewise relevant, with individuals moving from one institution to another or having papers accepted to conferences not included in the *Index* (iSchools, for example), which echoes the lack of inclusiveness in topics and scholars from the ADHO conference proceedings acknowledged earlier. The sharp decline in 2020 reflects the impact of the global pandemic, not only restricting travel but also significantly increasing staff workloads as all teaching needed to be moved online and staff with caring responsibilities were often directly impacted.

In total, 246 authors contributed to papers that listed UCL affiliations; 77 of them were UCL scholars, with 169 affiliated elsewhere. On average, one UCL author has 4.4 co-authors in the dataset, which is relatively high compared to other institutions during the same period. For example, based on the *Index* of DH Conferences (Weingart et al., 2023), authors affiliated with KCL have on average 3.9 co-authors, and Cambridge authors have 3.0 co-authors. Table 5.1 shows the top ten UCL authors ranked by number of papers for DH conferences in our dataset.

Table 5.1 The top ten UCL scholars by the number of papers for DH conferences, data from (Weingart et al., 2023) 1970 to 2023

	<i>Scholars</i>	<i>Papers</i>	<i>Average year</i>	<i>Co-authors</i>	<i>Presumed gender</i>
1	Melissa Terras	38	2012	99	F
2	Claire Warwick	24	2009	62	F
3	Julianne Nyhan	13	2017	28	F
4	Simon Mahony	8	2016	13	M
5	Ann Blandford	5	2008	26	F
6	Oliver Duke-Williams	5	2015	13	M
7	Alejandro Giacometti	4	2013	33	M
8	Anne Welsh	4	2013	14	F
9	Claire Ross	4	2011	9	F
10	George Buchanan	3	2006	4	M

As shown in Table 5.1, we can see the total number of papers each author with UCL as an affiliation presented at the DH conferences in our dataset, their average year of attendance,³ the number of unique co-authors they have worked with, and their presumed gender. Given that authors of different ages, and with varying lengths of institutional affiliation with UCL are included in Table 5.1, the “average year of attendance” provides a useful temporal context for this data. We have identified the author gender based on a well-tested name-gender assignment method (Sugimoto et al., 2015) and our knowledge of these authors. If we have mis-gendered any individuals through this method of classification, we apologise. It is acknowledged that some people are gender diverse, but the sources for that information are very limited, so this study follows the previous binary gender category convention (Rørstad & Aksnes, 2015). Among the most prolific ten presenters who were affiliated with UCL, six of them are female scholars, including the three most productive, with 88 papers in total – Terras, Warwick, and Nyhan. In comparison, four male scholars contributed 20 papers in total. Compared to other DH centres in the UK, UCL had a relatively higher female acceptance rate at conferences, led by three prominent female scholars who were active during the time covered in this dataset, although they have since this moved to other institutions. For example, within our current dataset, female scholars account for 48% of those recorded with a UCL affiliation, whereas previous scholarship shows that, based on both publications in major DH journals from 1966 to 2017 and conference papers DH2004 to DH2016, female scholars accounted for 30% of the total authors (Weingart & Eichmann-Kalwara, 2017; Gao et al., 2022).

In the visualisation of the co-authorship network that follows, scholars are the nodes, while the affiliative co-authorship association serves as the defining edge. Thus, the edges within a designated co-authorship network are established through the collaborative efforts of two scholars who cooperated on a scholarly paper. Specifically, this study counts the total number of papers to weigh the author node and the number of co-authored papers for the edge. The network’s size increases as more scholars collaborate, so it results in a more clear structure that offers an

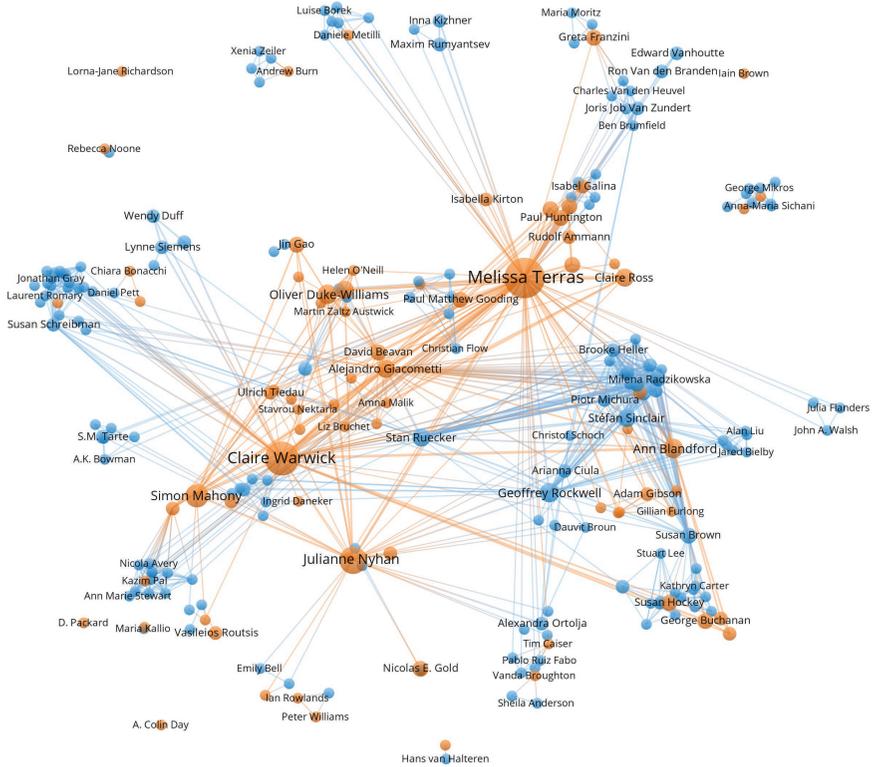


Figure 5.2 Co-authorship network of UCL authors and their collaborators at DH conferences, data from (Weingart et al., 2023) 1970 to 2023. [For printed version, light grey – UCL scholars and dark grey – non-UCL scholars; for online coloured version, orange – UCL scholars and blue – non-UCL scholars.]

output-centric view of characteristics such as connectivity levels and the prominence of scholars. VOSviewer 1.6.7 and Gephi 0.9.2 have been used for network construction and centrality measures, and the default disperse method was applied in VOSviewer. Figure 5.2 Co-authorship network of UCL authors and their collaborators at DH conferences, data from (Weingart et al., 2023) 1970 to 2023 [for printed version, light grey – UCL scholars and dark grey – non-UCL scholars; for online coloured version, orange – UCL scholars and blue – non-UCL scholars] and Figure 5.3 present the visualised co-authorship networks with UCL scholars highlighted in orange, and average publication year colour-coded in a heatmap timeline.

As illustrated in Figure 5.2, Co-authorship network of UCL authors and their collaborators at DH conferences, data from (Weingart et al., 2023) 1970 to 2023 [for printed version, light grey – UCL scholars and dark grey – non-UCL scholars; for online coloured version, orange – UCL scholars and blue – non-UCL scholars] and Figure 5.3, specific nodes (scholars) within the network act as crucial

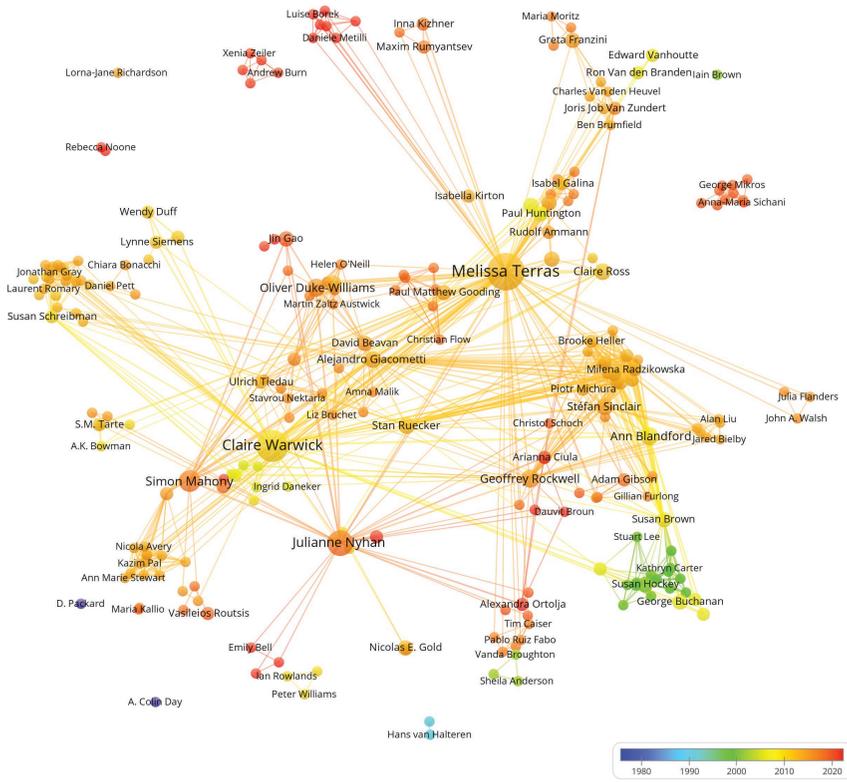


Figure 5.3 The co-authorship network of UCL authors and their collaborators at DH conference, heatmap timeline version, data from (Weingart et al., 2023) 1970 to 2023.

connectors, evident through higher betweenness centrality values computed using Gephi’s measurements. Notably, a significant portion of these influential connectors are female scholars, indicating their substantial contributions to the establishment and development of collaborative DH networks at UCL. As we know from previous studies (Gao et al., 2022), female scholars in DH are often the main forces maintaining scholarly connections, and they are frequently the icebreakers that bridge isolated groups. Whether or not women are better communicators, or have been socialised in this way (Eagly, 2013), female scholars in digital humanities at UCL have different patterns of collaboration which helped UCL build more collaborative networks and achievements. These findings prompt a consideration of wider academic publication patterns that indicate men often have a tendency to work alone or cite and collaborate more frequently with male authors (Bozeman & Gaughan, 2011). This phenomenon invites reflection on the implications of such gender-related biases in the context of DH collaborations. However, it is important to recognise that UCL is unusual in its approach to gender inclusivity, perhaps owing to its long history of female participation and early coeducation. It also boasts a larger proportion of female faculty than many other universities in the UK

(Times, 2022). These factors suggest that UCL's DH network represents a distinctive and forward-thinking model for promoting diverse and collaborative scholarly connections, which challenges assumptions about gender imbalances often observed in academic collaboration patterns.

One particular factor to notice is that the interdisciplinarity of the DH scholars, especially the female ones, helps to bring new ways of working to the field. It is necessary to emphasise that these scholars, such as Terras, Warwick, and Hockey, have championed inclusion of everyone involved in the research, especially research students, as authors of conference papers and publications stressed the importance of collaboration and collaborative culture in reaction to traditional humanities. This is consistent with the collegial, inclusive, approach, which Hockey and other digital humanities pioneers always strove to promote, from the infancy of the field.⁴

The analysis of the dataset reveals new patterns in the gender distribution of presenters affiliated with UCL at DH conferences. The considerable representation of female scholars, particularly within the top ten most prolific presenters, suggests that women at UCL made significant progress towards greater gender diversity, a pattern that challenges the historical gender disparities documented in previous studies (Weingart & Eichmann-Kalwara, 2017). UCL's female faculty contributed to the progress made in fostering inclusivity and gender balance within academic conferences, and these findings not only provide insights into the changing landscape of DH research but also highlight the role of prominent female scholars in driving this transformation.

Additionally, there is substantial evidence within the dataset indicating that both early-career scholars and PhD students frequently presented their work with the assistance and supervision of their mentors. This practice further highlights UCL's proactive approach in providing financial support at departmental and faculty level for the participation of PhD students at conferences. From a quantitative perspective, we have provided a more visualised image of the UCL scholarly co-authorship and collaborations in digital humanities, and below we continue our discussion about teaching DH at UCL, with in-depth examples that reflects on the collaborative patterns demonstrated here.

4 DH pedagogy at UCL

Fostering collaboration not only within research networks but also within the classroom has been a feature of digital humanities at UCL, and it has come in two phases. The first was from the launch of the MA/MSc Digital Humanities in 2011 (Terras, 2010). The innovative dual designation of the programme as MA and MSc was intended to allow students to follow paths through the programme with different degrees of technical, computer scientific, content. It was also designed to attract students from a range of backgrounds, including STEM disciplines, although in practice most students had a first degree in the humanities.

This programme was originally developed with desktop and laptop computing in mind, and in an era when getting material online was somewhat less straightforward than it is in 2024. The first iPhone smartphone by Apple launched in the UK

in November 2007 (Apple, 2007) and took time to have its full impact on the way of life of students and DH practitioners (Crymble, 2021, pp. 72–78), nevertheless, mobile computing was introduced to the DH module Internet Technologies from 2012. However, in general, students tended to focus on textual content in the classroom, as was typical of much DH work circa 2010, while digital images and videos remained difficult formats to work with at scale until later in the decade.

Some of the modules included learning the practicalities of digitising images and objects to get them into the computer, for example, Digital Resources in the Humanities at UCLDIS, started by Hockey and developed further by Terras in 2003. Later, case studies that discussed the teaching for this module revealed the integration of object-based learning within the DH programme (Nyhan et al., 2014; Kador et al., 2018, p. 164), exemplified by the Galton collection,⁵ which highlighted the student connections with seemingly disparate subjects within the collections and their challenges to problematise their knowledge and apply it to novel situations. Discussions on creating a digital collection from this material not only indicate technological aspects but also emphasise the necessity of sensitive and ethical approaches in making digital collections universally available. These case studies raise essential questions about the role of DH in disrupting techno-triumphalism and preparing students for multifaceted careers in diverse industries. For this reason, teaching both on the MA/MSc in DH and the MA in Electronic Communication and Publishing which preceded it always included discussion of the social and ethical context of digital technologies.

The module Introduction to Digitisation has partnered with the Asia Department at the Victoria and Albert Museum (V&A), which demonstrates the transformative potential of digital tools in engaging with museum objects in storage (Gao & Hongxing, 2023). Through the Chinese Export Watercolours (CEW) project, our students contributed to digitising paintings made in the 18th and 19th centuries, fostering practical skills, and contributing to best practices in museum digitisation. The public nature of this learning, where students ‘learn in public’ expands beyond traditional research activities to encompass a broader, digitally iterative, and collaborative approach (Kador et al., 2018, p. 167). This project also reflects on how we foster collaborative pedagogy techniques that leverage historical materials, highlight the convergence of collections and digital spaces in a truly interdisciplinary manner.

Another module is XML, a textual markup format popular in the scholarly editing community to format and otherwise annotate interesting details in a text (all references to people, or places, or different parts of speech). This XML was taught alongside modules that introduced the basics of web publishing, with HTML, CSS, JavaScript, and PHP used to present that material on the live web, providing students with a broad technical aptitude that was not likely embedded in their first degree. The workflow was often about getting cultural relics (objects, texts) into the body of the computer, where they could be shared via the web. Students also learned about digital humanities tools and methods, both aimed at textual analysis (Voyant, Antconc, etc.) and at geospatial work (GIS), which could lead to research findings in traditional humanities disciplines, and which could act as a springboard into PhD study.

The focus on technology and skills development was an important part of the programme as feedback from both students and employers made it clear that skills made their CVs stand out against those of other humanities students and gave our graduates an advantage in the job market. They could speak the language of both the technologists and the non-technical staff (Mahony & Pierazzo, 2012). The specific skills they learnt were of course transient, as technology inevitably evolves; however, the ability to learn and teach oneself technology is a lifelong skill, as is the programme's focus on developing cognitive ability and new ways of thinking both with and against the machine. Students would often come with entrenched and unquestioned assumptions about the physical and digital being in an oppositional and hierarchical relationship; these assumptions needed to be challenged and disrupted. Both have a part to play in our understanding of artefacts and collections and the students are challenged to reflect on the ways in which knowledge is constructed, curated, and communicated (Mahony et al., 2016).

UCLDH has close relationships with UCL Library Special Collections as well as UCL Museums and Collections (now known as UCL Culture) which enabled both hands-on and object-based learning sessions as part of our modules. Indeed, an introduction and practical experience with specialists in UCL Special Collections and Museums was a feature of students' induction sessions. These, together with our work placement module, gave many students valuable experience within the museum and library sectors.

The second teaching phase of DH at UCL emerged later in the 2010s as the smartphone era progressed and new technologies such as more evolved social media ecosystems, virtual reality (VR) and augmented reality (AR) emerged and captured the public imagination; incoming students began to shift their interests and expectations about what they would hope to learn in a DH postgraduate degree. The programme always attracted an international cohort of students with the majority being non-native speakers of English. However, the 2016 Brexit referendum result had a significant impact on European student recruitment to British programmes, with European students facing a tripling of their tuition fees without the benefit of EU policy that allowed them access to 'home' tuition rates (HESA, 2023). This, coupled with a general feeling that they were perhaps not wanted in Britain, led to a dramatic decline of more than 50% in European student numbers, not only at UCL but across the sector, which is only starting to reverse nearly a decade later. In their place came a growing number of Chinese applicants, with significant increases year-on-year from 2013 onwards, who became the largest single group of students in short order.

Their welcome arrival necessarily changed the pedagogical needs of the classroom because it could no longer be taken for granted that most students in the class had a British or European education or preferred learning styles. The segregated nature of the Chinese and Western Internets meant that students also arrived having few digital or popular culture references in common. China also had invested heavily in some digital cultural technologies that the West had not, particularly in AR and VR. This is best exemplified by the International Dunhuang Project hosted at the British Library which launched in 1994 (British Library, 2022), and also the

Digital Dunhuang project in China, launched in 2016 (2017 in English), which had provided 3D digitised representations of the Dunhuang Caves, a UNESCO World Cultural Heritage site, and provided a means for visitors to explore the caves virtually on their phones (Dunhuang Academy, 2016). The Palace Museum in Beijing has also invested heavily in a beautiful app that provides an engaging walkthrough of the museum with an accompanying storyline, that could give a visitor the feeling of having a private tour in a virtual space (Zhang, 2019). Chinese applicants to the DH programme at UCL frequently referred to both the Dunhuang and Palace Museum apps in their personal statements. It was incredibly rare for Western-based students to mention AR or VR as an area of interest, in part because Western museums had not yet made much engaging use of these technologies, focusing instead on more nuts-and-bolts priorities such as collection management and building maintenance.

What these conditions created was a cohort of students with very diverse, but culturally specific interests. This diversity is of course very welcome for any educator. Where it posed a challenge was in the students' own self-awareness of how their interests were linked to their culture of origin, and what else was out there that they might like to explore. They generally did not realise that other students in the classroom had such different interests and previous experiences, or different hopes and dreams about where their degree could take them. The teaching team recognised this challenge, and wanted to consider how students could build this self-awareness of their interests and blind spots, and also how they could use their time at UCL to expand their horizons to understand how other cultures were using or planning to use technology in the cultural sectors.

To address these changing interests, our DH programme's emphasis shifted away from working with textual material, which remains available for those looking to specialise in that way, but is not the default starting point as it once was. The module on XML has been one casualty of that shift and is currently being phased out of the programme to make space for a new module on social media. Secondly, the team introduced a new module called Global Digital Humanities in 2021, which helps students explore how different languages, cultures, religions, geographies, and economics have sculpted the ways people in different parts of the world approach digital humanities (Fernández l'Hoeste & Rodríguez, 2020; Crymble & Afanador-Llach, 2021; Dodd, 2021; Risam & Josephs, 2021). This module built upon the expertise of one of the authors of this chapter, Adam Crymble, who chaired the multilingual *Programming Historian* project, whose tutorials offered free DH skills training in four languages (English, Spanish, French, and Portuguese). Through the evolution of that project, it became clear to Crymble and others working on it, that technological needs varied across space and in different cultures. The "Global Digital Humanities" module was designed to impart that knowledge to students. Each week focuses on a different country or region, with weeks on China, the UK, North Africa, Latin America, and a week on Indigenous digital humanities. Most students in the class will have one week focusing on the place they came from, providing them with the chance to be the temporary experts for their peers. The remaining weeks, they learn about assumptions they may have had

about how typical their own experiences with technology have been. For example, students in China are often surprised that Western students on the programme do not share their passion for the museum sector. Students in the West are often blind about how much work goes into multilingual technologies in the rest of the world, having grown up in an English-speaking bubble (Galina, 2014; Mahony & Gao, 2018; Spence & Brandao, 2021).

Students on the module are challenged to become aware of their digital positionality, and to be globally focused technology professionals. Their major assignment on the module is to write a report advising the government of a country they have never lived in, on how they can best develop their own digital humanities degrees that suit the local needs and culture best. This forces students to explore solutions across cultural boundaries, to provide culturally sensitive suggestions, and gives them the skills to challenge the status quo at home or to take their skills abroad in a productive manner. This has been a natural evolution of the programme, designed to empower students with skills that can help them make an impact on the world stage through a deeper understanding of technology's connections to local cultures.

5 Widening the engagement at UCL

The growth and development of UCLDH, together with the taught graduate programme, coincided significantly with the year-on-year increase in the number of students from China. UCL has paid increasing attention and allocated resources to the development of connections and collaborations in the Greater China area. UCL had a presence at the China Scholarship Council Graduate Fair (CSCGF) for many years (this is now the China Scholarship Council-UCL Joint Research Scholarship), as well as setting up a strategic partnership with Peking University (PKU). In addition to this, funds have been available under the UCL Global Engagement initiative for connections and collaborations in East Asia with specific Partner Funds which now, as well as Peking University, include Zhejiang University, and Shanghai Jiao Tong University. Simon Mahony, one of the authors of this chapter, was successful in attending the CSCGF Beijing event from 2014 to 2018 as well as being awarded funding grants for travel and networking in mainland China. The growth and development of DH in China has been covered elsewhere (Tsui, 2020; Chen & Tsui, 2020; Wang et al., 2020), and this growth together with Mahony's support from UCL Global for travel and research trips enabled UCLDH to set up many connections with Chinese researchers and research centres. Beyond this, Mahony received many invitations to speak at conferences and give guest lectures to faculty and students at universities and other institutions.

While the universities strive to construct strategic partnerships at a high level and set up joint degree programmes and other initiatives, individuals, however, set up connections and relationships at a personal level. This has been a strength of UCLDH's relationship with China and has given UCLDH a presence at all the major DH research centres and groups in China as well as at many conferences and symposia (Mahony & Gao, 2018). Chinese students considering studying DH in the UK would have several choices and could be guided beyond the university rankings with a simple web search which would find links to staff representing

UCL and UCLDH in China, speaking at universities and conferences, and perhaps (as has happened on several occasions) at their own university.

Research trips are often reciprocal and UCLDH was delighted to host Professor Wang from Wuhan (and editor of this volume) in 2016 as our first Chinese visitor and who was followed by a succession of others over the following years. In 2019, Terras, Vanhoutte, and Gao were invited to Nanjing University to launch the Chinese translation of *Defining Digital Humanities: A Reader*, and this trip also fostered the foundation of the Chinese Digital Humanities Alliance (CDH) in 2019. In addition, Mahony was an invited guest speaker at the first Chinese National Digital Humanities Conference (CDH), held at Dunhuang in 2019. In the following year, Terras gave an online keynote address at the second CDH conference hosted at Shanghai Library, with Mahony on the Expert Council for the event. The tenth anniversary of UCLDH was in 2020 and we had arranged a succession of events which was to have included a two-day symposium, ‘Digital Humanities and the Library, Research Partners’, in collaboration with UCLDH, UCLDIS, UCL Library, PKU DH and PKU Library. This was supported by the UCL Partner Funds and would have included the dean and the director of the PKU DH centre (PKUDH) as well as DH researchers from PKU Library. As with all UCLDH events, this would have been an opportunity to engage and involve our students. Unfortunately, this had to be cancelled due to the pandemic.

As mentioned, the increased UCLDH connection with China has coincided with the significant growth in the number of Chinese applicants and, particularly following Brexit and the consequent impact on applications from within the European Union, they have become the largest single group of students on our taught programme. This in turn helps to raise the profile of both the centre and programme as graduating students become our ambassadors on their return home. We are also seeing an increase in the number of Chinese PhD students within the department (one of whom, Jin Gao, is now permanent UCLDIS staff, lead-author of this article, and co-editor of this volume), giving us more opportunity to connect with cultural aspects and sensitivities with their guidance as staff and teaching assistants (TAs). As UCL, more generally, increases its links with China through the development of formal partnerships and making funds available for travel and networking, UCLDH will continue to nurture our Chinese connections. We shall continue to build bridges, reaching out beyond our own cultural echo-chamber to promote communication and understanding, teaching ourselves as well as our students, to share knowledge and learning, to overcome cultural barriers and other obstacles to achieve harmony and greater prosperity for all.

6 Conclusion

Reviewing the institutional history of DH holds significant importance in shaping the future trajectory of the field. Retrospective studies, like the one undertaken of UCL in this chapter, provide a critical lens through which we can reflect on our past, interrogate our present, and forge a path towards a more inclusive and sustainable future for DH. By examining the successes and setbacks, the triumphs and trials of DH at UCL, this chapter helps us learn from past experiences and ensure

that our collective efforts are informed and guided by a broader understanding of the field's evolution. This knowledge empowers us to actively work towards creating a DH community that not only celebrates diversity but also actively seeks to overcome the barriers that hinder equality, diversity, and inclusion.

Notes

- 1 We extend our gratitude to Prof. Julianne Nyhan, Prof. Melissa Terras, Prof. Oliver Duke-Williams, Prof. Andrew Rosta, Dr Scott B Weingart, Dr Pang Rui, and Dr Bonnie Buyuklieva, for their generous contributions of insights and comments, offered amidst their busy schedules, which significantly enriched this chapter.
- 2 We acknowledge that this dataset does not represent the entirety of UCL's (or any other institutional) representation at DH conferences during this period. Nor does it include DH contributions to discipline-specific conferences not spearheaded by DH organisations. We also acknowledge the lack of inclusiveness and diversity of topics and scholars among DH conference proceedings. Nevertheless, this dataset provides a useful snapshot of participation in conferences between 1970 and 2023, and will be used as the basis for the network analysis in this study.
- 3 The average year of attendance for scholars at DH conferences is calculated by finding the mean of the individual years in which the particular scholar attended these conferences, providing a measure of their collective historical engagement with the events. For example, if scholar A attended 2010 conference and 2012 conference, then the average year of attendance is $(2010 + 2012)/2 = 2011$.
- 4 It is striking that almost every individual interviewed by Nyhan and Flinn (2016a) remarks on how open and friendly they found DH to be, on being introduced to the field, as opposed to traditional humanities disciplines.
- 5 More information related to Galton collection can be found here (Langkjær-Bain, 2019). We acknowledge that the problematic aspects of the Galton collection were put front and centre in the teaching as indicated in (Nyhan et al., 2014).

References

- ADHO. (2022). Response to "The circus we deserve? A front row look at the organization of the annual academic conference for the Digital Humanities". *Digital Humanities Quarterly*, 16(4). <http://www.digitalhumanities.org/dhq/vol/16/4/000664/000664.html>
- Apple. (2007, January 9). *Apple reinvents the phone with iPhone*. Apple Newsroom (United Kingdom). <https://www.apple.com/uk/newsroom/2007/01/09Apple-Reinvents-the-Phone-with-iPhone/>
- Bailey, M. Z. (2011). All the digital humanists are white, all the nerds are men, but some of us are brave. *Journal of Digital Humanities*, 1(1). <http://journalofdigitalhumanities.org/1-1/all-the-digital-humanists-are-white-all-the-nerds-are-men-but-some-of-us-are-brave-by-moya-z-bailey/>
- Barron, D. W. (1973). FORTRAN techniques with special reference to non-numerical applications, A. C. Day, Cambridge University Press, 1972. No. of pages: 96. Price: £2.50. *Software: Practice and Experience*, 3(4), 404. <https://doi.org/10.1002/spe.4380030415>
- Batty, M., & Evans, T. (2022, April 20). *HARMONY. The Bartlett Centre for advanced spatial analysis*. Retrieved from <https://www.ucl.ac.uk/bartlett/casa/research/current-projects/harmony>

- Batty, M., Hudson-Smith, A., Dodge, M., & Doyle, S. (1998, January 1). *Modelling virtual urban environments*. CASA Working Paper 1, The Bartlett Centre for Advanced Spatial Analysis. <https://www.ucl.ac.uk/bartlett/casa/publications/1998/jan/casa-working-paper-1>
- Berry, D. M., & Fagerjord, A. (Eds.). (2017). *Digital humanities: Knowledge and critique in a digital age*. Polity.
- Blandford, A. (2011). UCLIC@10: The changing face of interaction design. *The Ergonomist*, 6–7.
- Bozeman, B., & Gaughan, M. (2011). How do men and women differ in research collaborations? An analysis of the collaborative motives and strategies of academic researchers. *Research Policy*, 40(10), 1393–1402. <https://doi.org/10.1016/j.respol.2011.07.002>
- Brandeis Library. (2013, May 17). Digital Humanities: From 1851? *Brandeis Library*. Retrieved from <https://blogs.brandeis.edu/library/2013/05/17/digital-humanities-from-1851/>
- British Library. (2022, October 8). International Dunhuang Project. *The British Library*. Retrieved from <https://www.bl.uk/projects/international-dunhuang-project>
- Buchanan, G., Gow, J., Blandford, A., Rimmer, J., & Warwick, C. (2006). Representing aggregate works in the digital library. *Lecture Notes in Computer Science* (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), 4172 LNCS (pp. 532–535).
- Busa, R. (1950). Complete index Verborum of works of St. Thomas. *Speculum: A Journal of Medieval Studies*, XXV(1), 424–425.
- Butler, C. S. (1974, December 13). *International Meeting/Annual General Meeting of the Association for Literary and Linguistic Computing*, London.
- Butler, T., Fisher, S., Hockey, S., Coulombe, G., Clements, P., Brown, S., Grundy, I., Carter, K., Harvey, K., & Wood, J. (1999). *Can a team tag consistently? Experiences on the Orlando Project*. ACH/ALLC/ACH/ICCH/ALLC/EADH 1999 – Virginia. <http://www2.iath.virginia.edu/ach-allc.99/schedule.html>
- CAAL. (2019, April 10). *CAAL*. Institute of Archaeology. <https://www.ucl.ac.uk/archaeology/research/caal>
- Ceccaldi, E., Bardy, B., Bianchi-Berthouze, N., Fadiga, L., Volpe, G., & Camurri, A. (2020). The first international workshop on multi-scale movement technologies. *Proceedings of the 2020 International Conference on Multimodal Interaction* (pp. 895–896). <https://doi.org/10.1145/3382507.3420060>
- Cheshire, J. (2017, July 28). Roger Tomlinson’s PhD: The first in GIS – James Cheshire. *James Cheshire’s Blog*. <https://jcheshire.com/resources/roger-tomlinsons-phd-the-first-in-gis/>
- Chowdhury, I. (2013). A historian among scientists: Reflections on archiving the history of science in postcolonial India. *Isis*, 104(2), 371–380. <https://doi.org/10.1086/670955>
- Crymble, A. (2021). *Technology and the historian: Transformations in the digital age*. University of Illinois Press.
- Crymble, A., & Afanador-Llach, M. J. (2021). Digital history: The globally unequal promise of digital tools for history: UK and Colombia’s case study. In J. Clark & A. Nye (Eds.), *Teaching history for the contemporary world tensions, challenges and classroom experiences in higher education* (pp. 85–98). Springer (7; Issue 7). <http://doi.org/10.1007/978-981-16-0247-4>
- Day, A. C. (1972a). *A London Fortran course*. The Athlone Press.
- Day, A. C. (1972b). *Fortran techniques: With special reference to non-numerical applications (Reprinted)*. Cambridge University Press.

- Day, A. C. (2004). *Biography of Dr A. Colin Day. Colin Day & Roget's Thesaurus of the Bible*. <https://colinday.co.uk/biography/index.shtml>
- Day, C., & Marriott, I. (1976). Software reviews: COCOA: A word count and concordance generator. *Computers and the Humanities*, 10(1), 56–56. <https://doi.org/10.1007/BF02399143>
- Dodd, M. (Ed.). (2021). *Exploring digital humanities in India: Pedagogies, practices, and institutional possibilities*. Routledge, Taylor & Francis Group.
- Dunhuang Academy. (2016). 数字敦煌 [Research project website]. Digital Dunhuang (数字敦煌). Retrieved from <https://www.e-dunhuang.com/>
- EADH. (2023a). *EADH – The European Association for Digital Humanities*. <https://eadh.org/>
- EADH. (2023b). *Susan Hockey—Curriculum vitae & publications*. EADH – The European Association for Digital Humanities. <https://eadh.org/susan-hockey-curriculum-vitae-publications>
- Eagly, A. H. (2013). *Sex differences in social behavior: A social-role interpretation* (1st ed.). Psychology Press. <https://doi.org/10.4324/9780203781906>
- Estill, L., Guiliano, J., Ortega, É., Terras, M., Verhoeven, D., & Layne-Worthey, G. (2022). The circus we deserve? A front row look at the organization of the annual academic conference for the Digital Humanities. *Digital Humanities Quarterly*, 16(4). <https://www.digitalhumanities.org/dhq/vol/16/4/000643/000643.html>
- Farrington, M. G. (1970). Symposium on the uses of the computer in literary research: A conference report. *Computers and the Humanities*, 4(5), 315–317.
- Fernández l'Hoeste, H. D., & Rodríguez, J. C. (Eds.). (2020). *Digital humanities in Latin America*. University of Florida Press.
- Fuller, D. Q., & Pang, R. (2015). The International Centre for Chinese Heritage and Archaeology (ICCHA): After a decade of success. *Archaeology International*, 18(1). <https://doi.org/10.5334/ai.1806>
- Galina, I. (2014). Geographical and linguistic diversity in the digital humanities. *Literary and Linguistic Computing*, 29(3), 307–316. <https://doi.org/10.1093/lc/fqu005>
- Gao, J., Duke-Williams, O., Mahony, S., Bold, M. R., & Nyhan, J. (2017, August). The intellectual structure of digital humanities: An author co-citation analysis. *Digital Humanities 2017*, Montreal. <https://dh2017.adho.org/abstracts/083/083.pdf>
- Gao, J., & Hongxing, Z. (2023, June 21). *Chinese Export Watercolours (CEW) Project*. UCL Information Studies. <https://www.ucl.ac.uk/information-studies/chinese-export-watercolours-cew-project>
- Gao, J., Nyhan, J., Duke-Williams, O., & Mahony, S. (2022). Gender influences in digital humanities co-authorship networks. *Journal of Documentation*, 78(7), 327–350. <https://doi.org/10.1108/JD-11-2021-0221>
- Giacometti, A. (2014). *Evaluating multispectral imaging processing methodologies for analysing cultural heritage documents*. UCL.
- Giacometti, A., Gibson, A., Hess, M., Hindmarch, J., MacDonald, L., Pal, K., Robson, S., Terras, M., & Weyrich, T. (2014). Heritage imaging at UCL. *Presented at the Annual Conference of Association for Historical and Fine Art Photography (AHFAP)*.
- Gil, A., & Ortega, É. (2016). Global outlooks in digital humanities: Multilingual practices and minimal computing. In C. Crompton, R. J. Lane, & R. Siemens (Eds.), *Doing digital humanities: Practice, training, research* (pp. 58–70). Taylor & Francis Group. <https://www.taylorfrancis.com/books/e/9781315707860/chapters/10.4324/9781315707860-12>
- Grandjean, M. (2016). A social network analysis of Twitter: Mapping the digital humanities community. *Cogent Arts & Humanities*, 3(1), 1171458. <https://doi.org/10.1080/23311983.2016.1171458>

- Hardesty, W. H., & Mann, D. D. (1973). Literary and linguistic research: The Cambridge symposium. *Computers and the Humanities*, 7(5), 287–291.
- Harrison, D., & Rogers, Y. (2013). UCLIC. *Interactions*, 20(6), 84–87. <https://doi.org/10.1145/2533768>
- Hayes, B. (2017, February 6). Belles lettres meets big data. *American Scientist*. <https://www.americanscientist.org/article/belles-lettres-meets-big-data>
- HESA. (2023, January 19). *Higher Education Student Statistics: UK, 2021/22—Where students come from and go to study*. Higher Education Student Statistics. <https://www.hesa.ac.uk/news/19-01-2023/sb265-higher-education-student-statistics/location>
- Hockey, S. (2004). The history of humanities computing. In S. Schreibman, R. Siemens, & J. Unsworth (Eds.), *A companion to digital humanities* (pp. 1–19). Blackwell Publishing Ltd. <http://doi.wiley.com/10.1002/9780470999875.ch1>
- Holloway, C., & Barbareschi, G. (2021). *Disability interactions: Creating inclusive innovations*. Morgan & Claypool Publishers.
- Hudson-Smith, A., Gray, S., Ross, C., Barthel, R., De Jode, M., Warwick, C., & Terras, M. (2012). Experiments with the internet of things in museum space: QRator. *Proceedings of the 2012 ACM Conference on Ubiquitous Computing* (pp. 1183–1184). <https://doi.org/10.1145/2370216.2370469>
- Jones, A., & Churchhouse, R. F. (Eds.). (1976). The computer in literary and linguistic studies. *Proceedings of the Third International Symposium*. University of Wales Press.
- Jones, S. E. (2013). *The emergence of the digital humanities*. Routledge.
- Kador, T., Hannan, L., Nyhan, J., Terras, M., Chatterjee, H. J., & Carnall, M. (2018). Object-based learning and research-based education: Case studies from UCL curricula. In J. P. Davies & N. Pachler (Eds.), *Teaching and learning in higher education: Perspectives from UCL* (pp. 157–176) (11; Issue 11). UCL IoE Press. <https://www.ucl-ioe-press.com/ioe-content/uploads/2018/05/Teaching-and-Learning-in-Higher-Education.pdf>
- Kemman, M. (2021). *Trading zones of digital history*. De Gruyter Oldenbourg. <https://doi.org/10.1515/9783110682106>
- Kenneth, T. (2016, March 5). Reels of classic films tend to melt into goo; philanthropist David W. Packard won't let that happen. *Los Angeles Times*. <https://www.latimes.com/entertainment/movies/la-ca-mn-david-packard-film-preservation-20160306-column.html>
- Kirschenbaum, M. (2014). What is “Digital Humanities,” and why are they saying such terrible things about it? *Differences*, 25(1), 46–63.
- Langkjær-Bain, R. (2019). The troubling legacy of Francis Galton. *Significance*, 16(3), 16–21. <https://doi.org/10.1111/j.1740-9713.2019.01275.x>
- Le Deuff, O. (2018). *Digital humanities: History and development*. ISTE Wiley.
- Liu, A. (2018). *Digital humanities diversity as technical problem*. Alan Liu. <https://doi.org/10.21972/g21t07>
- Mahony, S. (2018). Cultural diversity and the digital humanities. *Fudan Journal of the Humanities and Social Sciences*. <https://doi.org/10.1007/s40647-018-0216-0>
- Mahony, S., & Gao, J. (2019). Linguistic and cultural hegemony in the digital humanities. *Proceedings of the Digital Humanities Congress 2018*. The Digital Humanities Institute. <https://www.dhi.ac.uk/openbook/chapter/dhc2018-mahony>
- Mahony, S., Nyhan, J., Terras, M., & Tiedau, U. (2016). Digital humanities pedagogy: Integrative learning and new ways of thinking about studying the humanities. *Proceedings of the Digital Humanities Congress 2014*, The University of Sheffield. <https://www.dhi.ac.uk/books/dhc2014/digital-humanities-pedagogy/>

- Mahony, S., & Pierazzo, E. (2012). Teaching skills or teaching methodology? In B. D. Hirsch (Ed.), *Digital humanities pedagogy: Practices, principles and politics* (pp. 215–225). Open Book Publishers. <https://doi.org/10.11647/OBP.0024.09>
- Makri, S., & Warwick, C. (2010). Information for inspiration: Understanding architects' information seeking and use behaviors to inform design. *Journal of the American Society for Information Science and Technology*, 61(9), 1745–1770. <https://doi.org/10.1002/asi.21338>
- Manley, E., Concannon, D., & Gray, S. (2016, November 28). *Africa Centre/I-Sense*. The Bartlett Centre for Advanced Spatial Analysis. <https://www.ucl.ac.uk/bartlett/casa/research/current-projects/africa-centrei-sense>
- McCarty, W. (2003). *Humanities computing*. In *Encyclopedia of Library and Information Science*. Marcel Dekker.
- Miles, J. (1946). *Major adjectives in English poetry from Wyatt to Auden*. University of California Press.
- Milton, R., Buyuklieva, B., Hay, D., Hudson-Smith, A., & Gray, S. (2018). Talking to GNOMES: Exploring privacy and trust around internet of things devices in a public space. *Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems*, 1–6. <https://doi.org/10.1145/3170427.3188481>
- Nebbia, M., Cilio, F., & Bobomulloev, B. (2021). Spatial risk assessment and the protection of cultural heritage in southern Tajikistan. *Journal of Cultural Heritage*, 49, 183–196. <https://doi.org/10.1016/j.culher.2021.01.012>
- Nyhan, J. (2023). *Hidden and devalued feminized labour in the digital humanities: On the index Thomisticus project 1965–67*. Routledge.
- Nyhan, J., & Duke-Williams, O. (2014). Joint and multi-authored publication patterns in the digital humanities. *Literary and Linguistic Computing*, 29(3), 387–399. <https://doi.org/10.1093/lc/fqu018>
- Nyhan, J., & Flinn, A. (2016a). *Computation and the humanities: Towards an oral history of digital humanities*. Springer.
- Nyhan, J., & Flinn, A. (2016b). So, into the Chopper it went: Gabriel Egan and Julianne Nyhan. In J. Nyhan & A. Flinn (Eds.), *Computation and the humanities* (pp. 237–256). Springer International Publishing. https://doi.org/10.1007/978-3-319-20170-2_16
- Nyhan, J., & Flinn, A. (2016c). They took a chance: Susan Hockey and Julianne Nyhan. In J. Nyhan & A. Flinn (Eds.), *Computation and the humanities* (pp. 87–97). Springer International Publishing. https://doi.org/10.1007/978-3-319-20170-2_6
- Nyhan, J., & Passarotti, M. (2019). *One origin of digital humanities: Fr Roberto Busa in his own words*. <https://doi.org/10.1007/978-3-030-18313-4>
- Nyhan, J., Terras, M., & Mahony, S. (2014). Digital humanities and integrative learning. In D. Blackshields, J. Cronin, B. Higgs, S. Kilcommins, M. McCarthy, & A. Ryan (Eds.), *Integrative learning: International research and practice* (pp. 235–247). Routledge (18; Issue 18). <http://www.routledge.com/books/details/9780415711074/>
- Pal, K., Avery, N., Boston, P., Campagnolo, A., De Stefani, C., Matheson-Pollock, H., Panozzo, D., Payne, M., Schüller, C., Sanderson, C., Scott, C., Smith, P., Smither, R., Sorkine-Hornung, O., Stewart, A., Stewart, E., Stewart, P., Terras, M., Walsh, B., ... Weyrich, T. (2016). Digitally reconstructing the Great Parchment Book: 3D recovery of fire-damaged historical documents. *Digital scholarship in the humanities*, fqw057. <https://doi.org/10.1093/lc/fqw057>
- Risam, R. (2015). Beyond the margins: Intersectionality and the digital humanities. *Digital Humanities Quarterly*, 9(2). <http://www.digitalhumanities.org/dhq/vol/9/2/000208/000208.html>

- Risam, R., & Josephs, K. B. (Eds.). (2021). *The Digital Black Atlantic*. University of Minnesota Press.
- Rockwell, G. (2007, May 2). An alternate beginning to humanities computing? *Theoretica. Ca.* <http://theoreti.ca/?p=1608>
- Rørstad, K., & Aksnes, D. W. (2015). Publication rate expressed by age, gender and academic position – A large-scale analysis of Norwegian academic staff. *Journal of Informetrics*, 9(2), 317–333. <https://doi.org/10.1016/j.joi.2015.02.003>
- Russell, D. B. (1965). *COCOA — A word-count and concordance generator*. Chilton Computing and UKRI Science and Technology Facilities Council. <http://www.chilton-computing.org.uk/acl/applications/cocoa/p001.htm>
- Sheppard, L., Reades, J., & Freeman, R. P. J. (2023). Gendering and diversifying the research pipeline: A quantitative feminist geographical approach to gender in higher education. *Annals of the American Association of Geographers*, 113(4), 817–833. <https://doi.org/10.1080/24694452.2022.2160302>
- Shiode, N., Batty, M., Dodge, M., Jiang, B., & Thurstain-Goodwin, M. (1998). The centre for advanced spatial analysis and its projects on geographic information systems and urban analysis. *Theory and Applications of GIS*, 6(1), 81–86. <https://doi.org/10.5638/thagis.6.81>
- Spence, P. J., & Brandao, R. (2021). Towards language sensitivity and diversity in the digital humanities. *Digital Studies / Le Champ Numérique*, 11(1). <https://doi.org/10.16995/dscn.8098>
- Sugimoto, C. R., Ni, C., West, J. D., & Larivière, V. (2015). The academic advantage: Gender disparities in patenting. *PLoS ONE*, 10(5), e0128000. <https://doi.org/10.1371/journal.pone.0128000>
- Terras, M. (2012, January 20). Infographic: Quantifying digital humanities. *UCL DH Blog*. <http://blogs.ucl.ac.uk/dh/2012/01/20/infographic-quantifying-digital-humanities/>
- Terras, M., Amman, R., & Gray, S. (2013). Textal: A text analysis smartphone app for digital humanities. *Journal of Digital Humanities*, 2(3). <https://journalofdigitalhumanities.org/2-3/textal-a-text-analysis-smartphone-app-for-digital-humanities/>
- Terras, M., Baker, J., Hetherington, J., Beavan, D., Zaltz Austwick, M., Welsh, A., O'Neill, H., Finley, W., Duke-Williams, O., & Farquhar, A. (2018). Enabling complex analysis of large-scale digital collections: Humanities research, high-performance computing, and transforming access to British Library digital collections. *Digital Scholarship in the Humanities*, 33(2), 456–466. <https://doi.org/10.1093/lhc/fqx020>
- Terras, M. M. (2010, July 30). Announcing the new MA/MSc in digital humanities at UCL. *UCLDH Blog*. <https://blogs.ucl.ac.uk/dh/2010/07/30/announcing-the-new-mamsc-in-digital-humanities-at-ucl/>
- Terras, M. M., Nyhan, J., & Vanhoutte, E. (Eds.). (2013). *Defining digital humanities: A reader*. Ashgate Publishing Limited.
- Thaller, M. (2017). Geschichte der digital humanities. In F. Jannidis, H. Kohle, & M. Rehbein (Eds.), *Digital humanities* (pp. 3–12). J.B. Metzler. https://doi.org/10.1007/978-3-476-05446-3_1
- The ICE. (2021). *The International Corpus of English (ICE)*. Retrieved from <https://www.ucl.ac.uk/english-usage/projects/ice.htm>
- Times. (2022, April 3). *Impact rankings: Gender equality*. Times Higher Education (THE). <https://www.timeshighereducation.com/rankings/impact/2022/gender-equality>
- Tomlinson, R. F. (1974). *Geographical information systems, spatial data analysis and decision making in government* [Doctoral thesis, University of London]. <https://discovery.ucl.ac.uk/id/eprint/1563584/>

- UCL. (2005). *LAIRAH: Log analysis of internet resources in the arts and humanities*. <https://www.ucl.ac.uk/infostudies/LAIRAH/>
- UCL. (2008a). *About us*. UCL Grand Challenges. <https://www.ucl.ac.uk/grand-challenges/about-us>
- UCL. (2008b). *(VERA) Virtual Environments for Research in Archaeology*. <https://web.archive.org/web/20140728122248/http://www.jisc.ac.uk/whatwedo/programmes/vre2/vera.aspx>
- UCL. (2022). *UCL Survey of English Usage*. <https://www.ucl.ac.uk/english-usage/>
- Valeonti, F., Bikakis, A., Terras, M., Speed, C., Hudson-Smith, A., & Chalkias, K. (2021). Crypto collectibles, museum funding and OpenGLAM: Challenges, opportunities and the potential of non-fungible tokens (NFTs). *Applied Sciences*, *11*(21), 9931. <https://doi.org/10.3390/app11219931>
- Wang, X., & Inaba, M. (2009). Analyzing structures and evolution of digital humanities based on correspondence analysis and co-word analysis. *Art Research*, *9*, 123–134.
- Warwick, C., Mahony, S., Nyhan, J., Ross, C., Terras, M., Tiedau, U., & Welsh, A. (2011). UCLDH: Big tent digital humanities in practice. *Digital Humanities 2011 Conference Abstracts*, 387–389.
- Warwick, C., Terras, M., & Nyhan, J. (2012). *Digital humanities in practice*. Facet Publishing.
- Watson, E., Eddo-Lodge, R., & Solnit, R. (2022, April 6). *City of Women London*. The Bartlett Centre for Advanced Spatial Analysis. <https://www.ucl.ac.uk/bartlett/casa/research/current-projects/city-women-london>
- Weingart, S. B., & Eichmann-Kalwara, N. (2017). What’s under the big tent?: A study of ADHO conference abstracts. *Digital Studies/Le Champ Numérique*, *7*(1). <https://doi.org/10.16995/dscn.284>
- Weingart, S. B., Eichmann-Kalwara, N., & Lincoln, M. (2023). *The Index of Digital Humanities Conferences Data* [dataset]. Carnegie Mellon University. <https://doi.org/10.1184/R1/12987959.v4>
- Zaagsma, G. (2013). On digital history. *BMGN – Low Countries Historical Review*, *128*(4), 3. <https://doi.org/10.18352/bmgn-lchr.9344>
- Zhang, M. (2019, April 17). Palace Museum to launch new mobile app with informative features. *CGTN Culture China*. <https://news.cgtn.com/news/3d3d414e3267444d34457a6333566d54/index.html>