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Emanuele Salerno[*]

Abstract

Digital Humanities have been evolving throughout the parallel evolution of computers, software and networking techniques, as well as the different attitudes of the interested scholars. Since the earliest historical phases of this research field, scholars have been debating on whether it can be considered to be a new academic discipline and whether it is revolutionary in nature. About twenty years ago, the early denotation of Humanities Computing evolved to the present one, and deep changes intervened in digital information technologies, as well as in their humanities applications. This paper accounts for the relevant scholarly debate, distinguishing between the early period and the most recent years, then tries to frame this process in a model of scientific revolution.

Keywords

Digital humanities; Humanities computing; Scholarly communication; Technology, art and literature.

Introduction

Digital Humanities (DH), "a broad designation that many might know, but fewer understand" (Pacheco 2022), is a relatively recent field of research. Most historical accounts find its origin in 1949, the same year when the first stored-program computer was realized, with the collaboration between Father Roberto Busa SJ and IBM for a computer-assisted compilation of word indices and concordances in St. Thomas Aquinas' works. Electronic computing thus became immediately a working tool for humanities.

The linguistic computing centers and the joint projects funded in the subsequent years brought the humanists who used to collaborate with computer scientists to develop quantitative approaches to their problems to originate what was then called Humanities Computing (HC).[1] Applying quantitative methods in fields where the qualitative approach was the almost exclusive tradition raised discussions within the new community and between the latter and traditional humanists, producing a wave of skepticism motivated by the fear that the new methods would have contaminated the genuine humanistic disciplines, or that humanities may "sell their essence to technology" (Pacheco 2022). The growing HC community also launched academic and professional associations and, in 1966, the first dedicated journal: *Computers and the Humanities* (*CHum*) (Raben 1966),

followed, twenty years later, by *Literary and Linguistic Computing* (*LLC*).

The *Digital Humanities Manifesto* (Schnapp and Presner 2009) denotes the quantitative approach as the characterizing feature of the so-called first wave of DH. A second wave is more "qualitative, interpretive, experiential, emotive, generative". To Berry[1], a third wave would be needed, centered on the notion of computational literacy, dealing with potentially new forms of literature and the media that support them. Indeed, the scope of DH has been broadening progressively, first by extending its concerns to disciplines different from linguistics and textual analysis, then to include problems such as the production of new humanistic objects (e-books, web pages, thematic maps,...) and the study of other media, such as image, video and audio recordings, besides the classical scholarly subjects. This process has been favored greatly by the availability of personal computers in the early 1980's and then of the Internet and the World Wide Web, from the late 1990's. The terminological switch from HC to DH occurred as an effect

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[1]David M. Berry, "Introduction", in (Berry 2012)

of this evolution,[2] emphasizing the fact that this research is no longer viewed as a branch of computing, but as the subject of a new academic discipline (Sula and Hill 2019). Actually, scholars have been long debating about whether DH is a true academic discipline (Brink 1990; McCarty 1998; Burnard 1999; Papadopoulos and Reilly 2020; Drucker 2021; Orlandi 2021; Pacheco 2022). A strictly related longtime debate is the one on inter-disciplinarity, or multi-disciplinarity, or trans-disciplinarity (McCarty 1999; Schreibman et al. 2004, 2016; Berry 2012; Darbellay 2019; Jacobs 2021), or even post-disciplinarity (Schnapp and Presner 2009).

Also relevant to our purposes is the question on whether HC/DH represents some kind of scientific revolution. Many authors agree on a positive response, such as Brink (1990), Schreibman et al. in the introduction to their edited volume (Schreibman et al. 2004), Ess[3], and some scholars interviewed by Nyhan and Flinn (2016), to name just a few. Berry[1], even states that digital humanities "could" represent a science revolution in the Kuhnian sense, without conducting a detailed analysis, however. Some recent contributions treat this issue more problematically, see Keeler (2002) and Pierazzo[4].

Salerno (2002) presented an account of the evolution of HC based on the early scholarly communication, particularly on the 1966-2000 papers in *CHum*, exposing the attitudes of (computing) humanists towards the issues of interdisciplinarity and scientific revolution. He also tries to frame the alleged revolution within the Kuhnian model. The result at that time was that a Kuhnian revolutionary process was not complete, but further 20 years have passed now, and many things have changed.

First of all, the mentioned predominance of text analysis among the research subjects is now reduced. For example, audio and visual data, cinema, music, dance, production and study of born-digital content and computer games, biometry, geography, cartography and geographic information systems have become part of DH (Zeng et al. 2022; Dibeltulo et al. 2020; Hong and Wu 2022; Escobar Varela and Hernández-Barraza 2020; Bailey-Ross et al. 2017; Salah et al. 2021; Wei et al. 2022). Even recently, however, some privilege is reserved to text: Frabetti[5] notes that DH is generally considered to embrace all the activities that draw their methods from computer science, such as image processing, data visualization and network analysis, "to produce new ways of understanding and approaching humanities *texts*" (italics mine). Another aspect of the evolution regards the commercial exploitation of software and data originally devoted to academic purposes, provided to either the same academic community or the public at large.

Steps towards humanistic disciplines, especially archaeology and cultural heritage, were also originated from different communities, often leading to new technologies and "publishable computer science research" (Kirschenbaum 2002). For example, the *Journal of Cultural Heritage* (Guarino 2000) and *Heritage Science* (launched in 2013) were born within the chemical community, the *International Journal of Document Analysis and Recognition* (Doerman et al. 1998) was originated in the pattern recognition community, and the *Journal of Computing and Cultural Heritage* (Arnold 2008) comes from the computer graphics community. This variety of applications gave rise to a number of specialized sub-fields, each with its reference sub-community. A list of DH journals compiled in 2019[6] counts 19 journals "exclusively" and 17 journals "significantly" dedicated to DH, out of a total of 104 titles. Meanwhile, between 2002 and 2005, numerous humanities computing associations joined in the Alliance of Digital Humanities Organizations (ADHO).[7] In 2005 and 2015, respectively, the two main journals in DH, *CHum* and *LLC*, changed their titles. Curiously, the one that suggested a more specific scope, *LLC*, became *Digital Scholarship in the Humanities* (*DSH*), "in an effort to rebrand to a wider audience" (Sula and Hill 2019). Conversely, the one that appeared more general in scope, *CHum*, became the specialized *Language Resources and Evaluation* (*LRE*) (Ide and Calzolari 2005). Schreibman et al. (2004) edited a volume describing the evolution of DH in its different applications and founding principles, and gathering the contributions of many scholars "brought together to consider digital humanities as a discipline in its own right". A second book from the same editors (Schreibman et al. 2016) gives an account of more recent developments, treating the different aspects of the discipline and concluding with a part on past, present and future of DH.

Importantly, the early 2000's were also marked by the birth of the first academic curricula in DH. An assay of the difficulties encountered in this development is

[2]A note on terminology in (McCarty 1999) offers an analysis of 'Humanities Computing' as opposed to 'Humanistic Informatics'. In this paper, these two terms are used almost interchangeably with DH, except where the historical period they are referred to needs to be stressed.

[3]Charles Ess, "Revolution? What Revolution? Successes and Limits of Computing Technologies in Philosophy and Religion", in (Schreibman et al. 2004, pp. 133-142)

[4]Elena Pierazzo, "Textual Scholarship and Text Encoding", in (Schreibman et al. 2016, pp. 307-321)

[5]Federica Frabetti, "Have the Humanities Always Been Digital?", in (Berry 2012, pp. 161-171).

[6]G. Spinaci et al., https://zenodo.org/record/4164710, last checked on 5 July 2023.

[7]https://adho.org/about/, last checked on 5 July 2023.

given by Rockwell (2003). In Italy, the first undergraduate curriculum in "Informatica Umanistica"[8] was started in Pisa in 2002, soon followed by a corresponding master curriculum (Salvatori et al. 2023). Whether this is the conclusive episode of a scientific revolution is one of the questions addressed in this paper.

Objective

Comparing opinions appeared in the literature in the last twenty years, this paper tries to complement the analysis presented in (Salerno 2002) as far as how the scholars consider the issues of (inter-multi-trans-post-) disciplinarity of DH and its revolutionary aspects. Their opinions emerge in what they write in journals, either in opinions/position papers or between the lines of more technical contributions. Interviews, as in (Nyhan and Flinn 2016), and seminar talks such as (McCarty 1999; Burnard 1999), when available, can help completing the picture. About the questionable disciplinary status of DH, this paper summarizes the ongoing debate, emphasizing the most recent opinions. As far as a digital revolution in humanities is concerned, an attempt is made of fitting the state of the art into the Kuhnian model to add something to Salerno (2002) in the light of the most recent events. In particular, it is perhaps time to ask whether the 'renewed' humanistic disciplines are now in a phase of the Kuhnian 'normal science'.

Methods

In the hope of finding a significant sample of the opinions of scholars who reflect upon themselves and the peculiarities of their community, the material for this research first consisted of all the papers published in *CHum* from 2001 to 2004 and in *DSH* from 2015 to 2022, thus updating what was reported in (Salerno 2002). During the analysis of these papers, several further contributions were included in the reference set, containing useful indicators for our purposes. As a result, some 150 contributions were left to be examined more thoroughly. These works were further scrutinized to identify the most relevant opinions of digital humanists about the problems of interest. Only the sources from which these opinions are drawn are cited in this paper. Furthermore, a shallow analysis was performed on the papers published in the *Journal on Computing and Cultural Heritage* (*JOCCH*), appearing in the list of journals "exclusively" dedicated to digital humanities,[6] to check possible similarities and differences with the structure and authorship of the papers in *CHum* and *DSH*. Some statistics was used in this case,

considering the number of authors per paper, their main disciplines and the most appropriate index terms.

Results

In this section, what is referred to the early period of digital humanities is only recalled, just to put the issues treated in the right frame. The reader can also find useful information and details regarding the years before 2000 in (Brink 1990; McCarty 1998, 1999; Burnard 1999; Kirschenbaum 2002; Sula and Hill 2019). The most recent contributions drawn from the collected material are used instead to pursue the main goal of this paper, that is, to analyze the developments occurred since the early 2000's.

Evolving scholarly communication

While analyzing the early contributions in HC literature, the difference with the papers published in scientific and technical journals is apparent. The pioneer journal *CHum* was originally conceived as a newsletter, featuring scholarly papers as well as initiatives such as conferences and projects, book reviews and software for humanities applications. During the first five or six years, say, until 1972, the format of the papers was different from the one characterizing the papers in scientific journals. An abstract was not always provided, and the text was not always divided in standard sections. Also, the bibliographic references did not follow a fixed standard. These features are typical of humanities production: a humanistic text needs to be read carefully and understood thoroughly; the typical reader of such a kind of paper normally does not need an abstract, and does not need to retrieve quickly technical or quantitative information. Also, typical humanities scholars use to work alone or, in any case, outside large collaborations. Thus, most papers in the early volumes of *CHum* feature a single author.

The things, however, were gradually changing. Lessard and Levison (1998) report that in the first 5 volumes of *CHum* the ratio of single-authored papers is 92%, whereas in volumes 26-30 (1992-1997) it is 63%. Compared to literary journals, where the single-authored papers were more than a 95%, the difference was remarkable, but was also huge when compared to a sample of technical/scientific journals, where that ratio used to range between 5% and 35%. "The sociology of our research", they conclude, "is closer to that of the humanities than that of the sciences". Also, "If we do insist on using the scientific approach, perhaps we should consider developing more research teams, including

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[8]That is, Humanistic Informatics, see footnote 2

specialists from statistics, computing science, linguistics, and whatever other field might be of benefit." The statistics by Sula and Hill (2019) confirm an increase in the number of authors until 2004, and this trend is further confirmed for the subsequent years by the literature analyzed here. Sula and Hill also provide information about the disciplines which the authors belong to, thus confirming the Lessard and Levison wish of 1998: in both *CHum* and *LLC*, the number of first authors in computing and computer science is just slightly less than the number of first authors in English language and literature, whereas the total number of authors and co-authors in computing and computer science is remarkably larger than all the others. Furthermore, a significant number of authors come from mathematics and statistics, engineering and sciences. This result is really relevant since Sula and Hill consider all the papers published in *Chum* from 1966 to 2004. Probably, disentangling the most recent years from the timeline, the result would have been even more impressive. To Pacheco (2022), supported by other recent contributions, the field of DH is now fully collaborative.

Although the number of non-text media considered has been increasing with time, Sula and Hill (2019) report that, in 2004, the papers dealing with text were a 59% in *CHum* and a 72% in *LLC*. Looking at the papers published in *DSH* during 2021 and 2022, we estimate about a 63% of papers dealing with text, that is, the situation has not changed much in the last two decades.

As far as *JOCCH* is concerned, analyzing the 27 papers with no less than 27 citations,[9] we find that probably the influence of humanities in computer science has not been as deep as the influence of computers in the humanities. These papers show 124 unique authors and co-authors, with a median of 4 per paper in a range of 1 to 20. The median of the citations received is 42, in a range of 27 to 333, and the dominant index terms are Computer graphics, Human-computer interaction and Information systems, for a total of 14 papers, followed by Archaeology and Arts and humanities, with just two papers each. The departments of provenance of the authors are mostly scientific, with computer science and the various branches of engineering in 95 occurrences. Only 24 authors belong to departments such as Archaeology, Technologies for cultural heritage and humanities, Maritime civilizations, Paleontology, Anthropology, Art, Creative and cognitive technologies, History, Linguistics and Psychology.

In summary, computers in humanities modified the scholarly communication in that new journals appeared and the format and authorship of papers has evolved towards a more 'scientific' attitude. An analysis of authorship

in the journals launched by the humanities community revealed an increasing collaboration between humanists and computer scientists, here including all the related or implied disciplines, such as statistics, mathematics and engineering, even though the first authors in humanities are still slightly dominant. As far as the journals born in the technological communities are concerned, the analysis should be deepened and more journals should be considered. From a limited analysis of the most visible papers in one of the most representative journals dealing exclusively with DH, the situation seems to be nearly the opposite. The dominant disciplines remain computer science and engineering, and the collaboration between humanists and computer scientists does not seem so pronounced as in the former case: most papers feature first authors coming from computer science, and specialists in the target humanities applications are rarely included in the author lists. This could mean that the collaboration between humanities and informatics in those cases is really limited. A more careful analysis is deferred to a future research.

The two cultures

As soon as Charles Snow pronounced his famous Rede Lecture at Cambridge (Snow 1959), HC was seen as a promise to bridge the gap between the Two Cultures, in that these had to be embraced "to bring the rigor and systematic unambiguous procedural methodologies characteristic of the sciences to address problems within the humanities".[10] Some of the early reactions to this conjecture are recorded in a survey titled "The two cultures", where a number of Italian humanistic personalities express their opinions about whether HC actually helps to reconcile science and humanities (Morando 1961, p. 143). Besides a few positive reactions, most of the responses show that sense of skepticism mentioned above. According to Burnard (1999), HC began as an "empirical reply" to the debate on the Two Cultures. More recent positions, with the new label of Digital Humanities definitely in use, include Rommel[11], who says that literary computing has brought the Two Cultures into contact, and Porsdam (2013), by whom DH is a "hybrid meeting point between the two cultures", but the assumption that "quantitative research can handle everything which the humanist must take into account" must be rejected, thus agreeing to her interpretation of Schlesinger Jr. (1962) and

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[9] That is, within the h-index of the journal. Data retrieved on 20 April 2023.

[10] Susan Hockey, 'The History of Humanities Computing', in (Schreibman et al. 2004, pp. 3-19).

[11] Thomas Rommel, 'Literary Studies', in (Schreibman et al. 2004, p. 89).

the criticism to Snow made by Leavis (1962). In the opinion of McCarty[12], what DH inherits goes far beyond the debate on the two cultures: "It inherits many centuries of now relevant work that has been foreign to the humanities since Galileo". To Montfort[13], closing the gap between the cultures would entail that "programmers" should learn something about the humanities as well. Edmond and Lehmann (2021), treat DH as an interdisciplinary research area, particularly in big data, and argue that, in the practical experience, a communication across different epistemic cultures is neither easy nor smooth: "computer scientists showed a reluctance to discussing what certain key terms might mean or imply, a lack of precision that would surely draw criticism in a purely humanities context". However, "when reaching across the boundaries of disciplinary norms and epistemic cultures become central rather than peripheral to progress, creative and productive compromises can be found."

There is no doubt that "creative and productive compromises" do have been found. The gap between the Two Cultures, however, although many authors maintain that it is definitely filled, seems to be still there in many respects. More specifically, considering the evolution in scholarly communication sketched above, it does not seem that the "programmers" have learned much about the humanities, although the humanities computing community "has had a hand in some of the most important developments in information technology" (Flanders and Unsworth 2002).

Is digital humanities an academic discipline?

The debate about DH as a discipline is not as old as the one on the Two Cultures. In a series of contributions in (Morando 1961), titled "Electronics and Literature", the problem is not addressed explicitly. Even years later, when the launch of *CHum* represented an essential step to the establishment of a new discipline, neither Raben (1966) nor Milic (1966) speak explicitly of humanities computing as a discipline, rather preferring to name it a "community". Apparently, even though a research community was already established through some 200 literary computing centers worldwide and a dozen conferences on the subject (Nyhan and Flinn 2016), a consciousness of the formation of a new discipline was not yet mature. Indeed, this question has been debated for years, and only recently seems to be settled with a positive response.[14] Ten years after his introductory editorial in *CHum*, Raben (1976) finally declares that this "scholarly area" is a well-established discipline, though warning against the hazards of scientism. As summarized by Salerno (2002), three factors enabled by the availability of computers were expected to change the methods in humanities: high speed,

logic processing and storage capacity. To leverage the logic processing capabilities offered by computers, the problems in humanities needed to be formalized, which was not common at that time. In the introduction to their volume, Schreibman et al. (2004) state that computing has not only provided the disciplines with tools, but also with "methodological focal points." This change in methods could be considered as a basis for a new discipline, but the emergence of a discipline also depends on social aspects. To McCarty (1999), as soon as a research area is recognized as a discipline, an institutional change must occur, such that the interested scholars can be recognized academically and their community is allowed to grow. He presents HC as an "interdiscipline", meaning that it exists "in the interstices of the existing fields". As such, it is not "just another administrative entity". What is first needed is a model for what is really interdisciplinary and then a method to draw from the disciplines what can be useful to HC. Since HC at that time did not entail any new administrative structure, the conclusion was that it was not an academic discipline. Rather than expecting the birth of a dedicated department, the ultimate response depended on fundamental changes in how academia as a whole is conceived. Years later, in a thorough examination of its implied meanings, McCarty[12] defines interdisciplinarity as an "abstraction", saying that much more energy has been spent to decide *what* it is ("a *Glasperlenspiel*", in his view) than to investigate the *how*, that is, how the discipline 'Digital Humanities', and how the DH scholar can really become interdisciplinary. Contrary to Klaassen (2020), to whom interdisciplinarity is basically "the ability to listen to one another, willingness to learn from one another", to McCarty it is something that should be earned individually by the scholar. Klaassen's basic definition entails that the humanities have an essential role in the provision of communication "that is key to capturing knowledge production and the dissemination of insights towards relevant fields." DH, extending this concept, needs its fully humanistic nature to find a motivating common ground, be it pertaining to any form of interdisciplinarity or leading to "new disciplinary boundaries".

Burnard (1999) agrees with McCarty that an academic discipline is "an organizational, bureaucratic concept",

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[12]Willard McCarthy, 'Becoming interdisciplinary', in (Schreibman et al. 2016, pp. 69-83).

[13]Nick Montfort, 'Exploratory Programming in Digital Humanities Pedagogy and Research', in (Schreibman et al. 2016, p. 105).

[14]See for example several contributions in (Salvatori et al. 2023).

determined by socio-political considerations.[15] Even though many scholars believe that an underlying theoretical framework is necessary, there are many examples of successful and established theory-free disciplines, as well as research fields endowed with strong theoretical bases that have never been recognized as disciplines. Therefore, Burnard concludes that HC is an academic discipline as many others. One of the arguments he brings in support of his thesis is, again, interdisciplinarity: HC is intrinsically interdisciplinary, as it encourages a "holistic" vision on the visual, aural and linguistic aspects of artefacts. With no harm to the traditional introspection characterizing humanities scholars, HC is methodologically focused. Edmond and Lehmann (2021) do not agree with this account, rejecting the vision of a discipline without a theory: "interdisciplinary co-operations often failed because of the lack of a shared theoretical framework", and "data without theory is as problematic as theories without evidence." Bradley (2019) reports complaints about "the lack of theoretical underpinning behind toolmaking for humanists." A recent account in the light of the developments occurred in modern universities is provided in (Wernli and Darbellay 2016), where the presence of institutional difficulties in recognizing interdisciplinarity is still highlighted, since the system is primarily built for disciplinarity. Nyhan and Flinn 2016, p. 6, note that the very definition of a discipline is not agreed upon by everybody and, somehow resembling Burnard's position, say that DH could be considered a discipline because it has the characteristics provided by such a social construct, that is, presence of university courses, academic journals and scholarly societies. This notwithstanding, many authors still reject the idea on grounds related to proper accreditation, the existence of very few autonomous departments, the lack of senior scholars accepting to collaborate in interdisciplinary research and the very sparse variety of subjects and personalities allegedly belonging to the community.

An attempt to define HC as a discipline by identifying the common features of the research work was done by Unsworth (2000) through the concept of scholarly primitives, a number of functions shared amongst disciplines, independent of any theoretical orientation. An extended and hierarchized set of primitives has been proposed recently by Pacheco (2022) to theorize the fundamentals of DH from a mixed qualitative/quantitative literature review. Accounting for the evolution from HC to DH, he recognizes that only recently the latter has entered the academic organization through new courses and graduations, and that it probably will need to take further time to see its influence on academia and society at large. About interdisciplinarity,

Pacheco evokes a "dilution of frontiers" between classical studies, literature, languages, computer science and data management. Even today, however, while discussing on whether DH should be considered a science, an interdiscipline, a frontier science or whatever else, the lack of a theoretical debate can bring to an uncritical acceptance of the reality or an unjustified fear of the new technologies. Hughes et al.[16] take the scholarly primitives to identify the common methods in DH. Put simply, these should be computational, that is, either based or critically depending on information technology, and located in a "key point of intersection" between disciplines, thus enabling otherwise impossible research to be conducted. From the scholarly primitives, Palmer et al. (2009) identify what characterizes interdisciplinary work through a graph including the fields of "humanities", "sciences" and "interdisciplinary", showing their mutual intersections, similar to the concept of humanities methodological commons proposed by Hughes et al.

Interdisciplinarity is the most used term referring to DH, meaning that this field is placed in between disciplines. Other two terms found in this study, multi-disciplinarity and trans-disciplinarity, respectively, seem to have the subtly different meanings of including many disciplines and going beyond a discipline to steal something from another one. The term post-disciplinarity used in the *Digital Humanities Manifesto* (Schnapp and Presner 2009) seems to mean something more, namely, that the production of knowledge does not derive any longer from disciplinary approaches. Darbellay (2019), besides providing a deeper insight into the meanings of the different prefixes to disciplinarity, attaches a high revolutionary potential to post-disciplinarity, since the other definitions are all based on the central notion of disciplinarity, that is, on the existence of more or less rigid boundaries between different epistemic, methodological and bureaucratic communities. He contests the notion of discipline as given by Nature, since it has only been developing during the last one or two centuries.[17] Indeed, the *Manifesto* (p. 5) states that post-disciplinarity can foster "disciplinary cross-fertilization", that is, as we understand, the disciplines evolve through mutual exchanges of paradigms and methods but, anyway, are still alive and necessary to the advancement of knowledge. The

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[15]See also Simona Turbanti, 'Le digital humanities come raccordo tra discipline, contesti e approcci diversi', in (Salvatori et al. 2023, part 11).

[16]Lorna Hughes et al., 'Digital Methods in the Humanities: Understanding and Describing their Use across the Disciplines', in (Schreibman et al. 2016, p. 150).

[17]Like Darbellay, Mirko Tavosanis, in (Salvatori et al. 2023, part 10), does not agree with this vision. See also Turbanti, footnote 15.

Manifesto also maintains that DH is "not a unified field, but an array of convergent practices". Looking at the variety of new scientific journals more or less relevant to DH, it can be conjectured that the initial convergence among different humanistic disciplines fostered by the use of computers has evolved in the sense that they have gained new approaches and insights, thus renovating their statuses. This can explain the multiplication of specialized communication sources, and also the fact that, as observed, even a journal with a supposedly general attitude, *DSH*, features papers in a few privileged fields. The increased attention to quantitative aspects could have shown that many problems, even in different disciplines, can be treated using the same approaches, and DH could thus be considered a 'cross-discipline' rather than an "inter-", "multi-", "trans-" or "post-" discipline (see also Palmer et al. 2009).

After the flourishing of humanities computing centers, DH also started to establish administrative structures by launching specific academic curricula, with their chairs, courses and faculties. The DH Course Registry[18] lists 128 bachelor, master and PhD programs worldwide, excluding individual courses, modules and summer schools offered by several universities. Whereas the success of these initiatives was "obviously unknown" in their early life (Salerno 2002), the growing number of academic curricula and their survival over the years demonstrate that, first, the attempt to provide an intrinsically multidisciplinary academic initiative with adequate administrative structures has been successful; second, the curricula in DH attracted a relevant number of students, which is also an index of their actual career perspectives.[19] Thus, the shared bases of DH are now accompanied by administrative structures and academic curricula, but the debate on its disciplinary status is still open. The evolution of HC to DH convinced many humanists to value the digital approaches to their research, but until recently some of the original skepticism still persists. Nothing has been simple and a number of issues are still open. About the experience in Pisa, Lenci[20] says that Humanities Informatics had to find its narrow room between the two classical strongholds of humanities and computer science, but its success has demonstrated that its initial motivation was well devised.

To Orlandi (2021), the humanities should not include social sciences,[21] although even linguistics, "indispensable" to him, is often considered a social science. Apparently, the compilers of the list cited at footnote 6 do not agree with him: among the journals dealing "significantly" or "marginally" with DH, they include titles referring to linguistics and sociolinguistics, literature and literary criticism, philology,

librarianship and information science, philosophy, ethics, sociology, history, art history, music and musicology and many other fields. Applying methods from information technology to all these disciplines is now quite common. Did these disciplines merge in DH or, rather, did they partially change their methods and objects of study including digital tools in their daily practice? In the latter case, is this a revolutionary change or just parallels what happened in physics, chemistry or mathematics, for example, where no one has thought to add the adjective 'digital' to mean that informatics has become a usual research tool? In the preface to (Schreibman et al. 2016), the authors foresee a time when this modifier will have become pleonastic in humanities. Pacheco (2022) agree with them and believes that, at present, it is necessary to mark a methodological transition, and will eventually be dropped. Robertson (2016) maintains that several disciplines are contained in DH, which have not erased their differences. He looks at DH as a house with many rooms, "entry points to central spaces where those from different disciplines working with particular tools and media can gather." This position can be compared to the one maintained by Turbanti[15]. Papadopoulos and Reilly (2020) say that DH has become a collage of disciplines, including several fields pertaining to social sciences. By these views, in summary, many different disciplines now share digital methods to pursue their aims, but each maintains its specific research objects and problems, and their evolution is conditioned by the new technological possibilities.[22]

Did humanistic disciplines experience a revolution in recent decades?

Already in (Morando 1961), a qualitative change in humanities caused by the use of computers is envisaged by several authors, among which Busa[23] and Pacifico[24]. Nyhan and Flinn 2016, Chapter 17, in accounting for the

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[18]Wissik et al. (2020) and `https://dhcr.clarin-dariah.eu/`, last checked on 5 July 2023.

[19]See `https://www.study.eu/article/study-digital-humanities`, last checked on 5 July 2023.

[20]Alessandro Lenci, '2002: Odissea nell'informatica umanistica', in (Salvatori et al. 2023, part 7).

[21]See also (Liu 2012), where humanities and social science are always treated separately.

[22]A survey by Gibbs and Owens (2012) has found that, however, strong concerns about the actual usefulness of technological tools were still alive until recently.

[23]Roberto Busa SJ, 'L'analisi linguistica nell'evoluzione mondiale dei mezzi d'informazione', in (Morando 1961, p. 103).

[24]Michele Pacifico, 'I nuovi Gutenberg: linguistica ed elettronica nel mondo, oggi', in (Morando 1961, p. 100).

early debate about the revolutionary nature of DH, say that, although the term revolution has largely been used in the literature, detailed discussions about it are seldom found. Many authors in (Schreibman et al. 2004, 2016) refer to DH as a revolution.

Salerno (2002) tries to include this process in the model of scientific revolution proposed by Kuhn (1962). In summary, this model assumes that the development of science is neither cumulative nor linear: successive historical phases of scientific knowledge do not entail a progress *towards* something, e.g., a deeper knowledge of "the truth"; rather, they mark some progress *from* something (Kuhn 1962, p. 170-171), that is, from a phase where a certain scientific paradigm is in force to a phase where a new paradigm comes into effect. To Kuhn, a scientific paradigm is a set of beliefs, conceptual tools and permitted problems shared by all the members of a scientific community during a historical phase called "normal science". The shift between one paradigm to the successive one is triggered by some crisis, not necessarily related, e.g., to some failure in experimental validation, but rather to the emerged impossibility to continue the "puzzle-solving" activity that characterizes the current normal science. Different paradigms are incommensurable: apparently similar concepts referred to different paradigms cannot actually be compared, and the most recent cannot be considered an extension or a refinement of the previous one. A dialectical phase accompanies the transition between two normal science periods, where more paradigms coexist until only one of them predominates.

Actually, the studies in humanities do not proceed as the ones in sciences: it is difficult to identify a period of normal science in humanistic studies.[25] The humanities community is trained historically, through the original sources, and not through ahistorical manuals, which instead dominate the education in sciences and are completely rewritten at each change of paradigm. Kuhn 1962, p. 165, excludes that his model is appropriate for humanities. On the other hand, 1) The concept of paradigm is not so rigid to prevent an extension thereof from being applied to humanities;[26] 2) Many authors in digital humanities, as well as in science, value the Kuhnian model as representative of their vision.

Brink (1990) has no doubt about the revolutionary nature of HC, adding some aspects of what Nyhan and Flinn 2016, p. 259-270, call "the motif of the underdog", that is, the diffuse feeling among scholars to be misunderstood and marginalized. Nyhan and Flinn also treat "the motif of revolutionary", very popular among the opinions of digital humanists. These two motifs are often put forward together and in some sense could be considered as foundational

myths: evoking a revolutionary present could be useful to provide the discipline with connections to previous successful revolutions, for example when comparing the use of digital tools and concepts in humanities to the Gutenbergian print revolution. Presner (2010) makes explicit reference to the Kuhnian model, also examining its premises and consequences: "Digital Humanities 2.0 introduces entirely new disciplinary paradigms, convergent fields, hybrid methodologies, and even new publication models that are often not derived from or limited to print culture." Suggestively, he also foresees the emergence of a *new* "Normal Humanities", apparently not wondering about the existence of any *old* one. We are, says Presner, "at the beginning of a shift in 'standards governing permissible problems, concepts, and explanations,' and also in the midst of a transformation of the institutional and conceptual conditions." That is to say: we are at the beginning of a Kuhnian paradigm shift. Hughes et al.[16] examine the digital techniques as used in the diverse disciplines and talk about changes in paradigms that create new knowledge, in particular, "asking new research questions", that is, being part of the shift characterizing a Kuhnian revolution. McCarty, in (Schreibman et al. 2004, p. 254), speaks explicitly of revolutionary changes, sharing the Kuhnian view with his colleagues. In (Schreibman et al. 2016, p. 75), he also treats the supposed revolution in the context of his vision of interdisciplinarity, which is perhaps the main transformative aspect in the recent history of humanities. Papadopoulos and Reilly (2020) identify the old paradigm as "the time-honoured heroic paradigm in which curiosity-driven, professional singleton scholars are privileged but securely tethered by tenure and scholarly tradition to an academy. At the far end of DH practice, we imagine an environment of knowledge pluralism engendered by promiscuous crowds of independent knowledge workers operating under an open, and overtly socially inclusive, ethos." About the new paradigm, however, they complain about "knowledge workers ... more or less unaffiliated, and thus unfettered by traditional career paths and ties to specific institutions, working on short-term contracts with no expectation of career progression within the contracting organization." Papadopoulos and Reilly are not the only

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[25]The concepts of paradigm and normal science have also been criticized variously in the fields of natural and exact sciences, see, e.g., Paul Feyerabend, 'How to Defend Society From Science' and Dudley Shapere, 'Meaning and Scientific Change', both in (Hacking 1981).

[26]The relative weakness of the original concept of paradigm has also been recognized by Kuhn himself, already in the second edition of his book (Kuhn 1962, p. 174) and in the successive developments of his thought (Kuhn 1977).

authors to fear exclusively optimistic views. Porsdam (2013) states: "the many new developments within DH must be discussed with a view not only to their potential, but also to their limits. Whether or not it may properly be classified as a Kuhnian paradigm shift – and the vote is still out on this – the digital turn and the involvement with computer-based approaches will cause substantial changes for both the teaching and the research in the humanities." To Schnapp and Presner (2009), the revolution is about expanding the quality and the impact of knowledge in human sciences and the "direct engagement in design and development processes". At the same time, they warn against the passive acceptance of technology, part of the so-called traditionalists' response to the newly available tools offered by the Internet. Critical remarks are also made by Pacheco (2022), who discusses different opinions on digital humanities and complains about the lack of a thorough debate.

In the light of these opinions, we now try to frame the evolution of DH into the Kuhnian scheme. Its first feature is the crisis of a paradigm. The steps to verify this condition have been summarized by Salerno (2002), who found some cues in musicology (Bel and Vecchione 1993) and lexicography (Spinosa 1990). More recent contributions speak explicitly of a crisis in the humanities, not only in music and literary studies, such as Pacheco (2022), Thomas[27], Ryan[28], van Zundert[29] and Warwick[30]. To Presner (2010), a crisis was still present at the time of his writing, but he also foresaw "the imminent disappearance of one paradigm and the emergence of another". For Claus Huitfeldt, interviewed by Julianne Nyhan (Nyhan and Flinn 2016, p. 234 ff.), indeed, the crisis is not even a crisis, as it is going on for decades. There is a recent change, however, consisting in a new emphasis on ethical aspects of the use of technology rather than in the evolution of methods and tools.

The second feature of the Kuhnian model is the paradigm shift. The problem remains in deciding whether such a thing as a 'paradigm of the humanities' really exists.[31] We would rather find easier to admit that each of the diverse humanistic disciplines has its individual paradigm, not excluding that they can also be grouped by paradigmatic similarities. Salerno (2002) identifies common traits in "intuition and trained mind": mechanical analysis was refused by traditional humanists, and also by the early computing humanists, who accepted the use of computers in their research but did not even think about changing the foundations of their disciplines. Formalization can surely be considered one of the characterizing traits of the new paradigm, and its effects have surely contributed in some change of viewpoint in humanistic disciplines. Also,

quantitative and statistical analysis have found in computers the enabling technology needed to extend their use and make their results senseful. In any case, considering the recent contributions testifying that a lively debate is still in place, it seems that the dialectical phase postulated by Kuhn is still continuing within humanities scholars: a normal humanities (fortunately) seems to be far from being realized. As noted, humanists are only marginally trained through manuals, so we cannot expect a fundamental rewriting and a subsequent abandonment of the current educational materials. Perhaps, the dedicated university curricula will contribute to change something under this respect: the modern digital humanists are likely to having been trained through manuals more than their predecessors. Whereas in (Salerno 2002) the paradigm shift was eventually declared not complete, many things in the last twenty years contributed to better fit our story in the Kuhnian model.

Conclusion

This paper is an account of the opinions about the disciplinary status and the revolutionary nature of DH. The evolution of scholarly communication is also synthesized to allow each contribution to be placed in the right context.

The disciplinary status of DH has always been the object of a lively debate, giving rise to a host of specific connotations, such as inter-discipline or post-discipline, on whose meanings not all the proposers agree. Compare, for example, the positions expressed by McCarty (1999) and Burnard (1999) to the recent analyses by Darbellay (2019) and Klaassen (2020). The launch of official curricula in DH contributes to corroborate the position, shared by many, that DH is rightfully an established discipline. Conversely, the number of recently founded academic journals dealing with applications of information technology to humanistic disciplines could be considered a sign that, actually, different disciplines in humanities have been absorbing new tools and methods, thus emerging as paradigmatically renewed but maintaining their specificities. The concept of

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[27] William G. Thomas, III, 'Computing and the Historical Imagination', in (Schreibman et al. 2004, p. 56-68).

[28] Marie-Laure Ryan, 'Multivariant Narratives', in (Schreibman et al. 2004, p. 415-430).

[29] Joris J. van Zundert, 'Screwmeneutics and Hermenumericals: The Computationality of Hermeneutics', in (Schreibman et al. 2016, p. 331-347).

[30] Claire Warwick, 'Building Theories or Theories of Building? A Tension at the Heart of Digital Humanities', in (Schreibman et al. 2016, p. 538-552).

[31] Probably, admitting the existence of a unique 'paradigm of sciences' would also be problematic.

methodological commons by Hughes et al.[16] could be used to delimit a unique discipline called Digital Humanities, if we accept, however, that it is a brand new discipline, exchanging themes and methods with human sciences just like engineering exchanges themes and methods with, e.g., physics and mathematics without being either physics or mathematics. Salerno (2002) tried to look more thoroughly into this process, considering the aspects of the Kuhnian model that he deemed sufficiently fitting into the humanities. The new facts intervened since 2002 contribute to fill some of the entries in that model, except perhaps the notion of normal science, which seems by no means appropriate to humanities. We could say that even though new paradigms are being introduced, a Kuhnian phase of normal humanities perhaps will never come. As Keeler (2002) recalls, "asking how to capture the essence of what works well in the present in order to improve the future" is more interesting than declaring a revolution.

Today, nearly all the scholars make use of information technology. This does not mean that all of them have become digital scholars. A historian, for example, who uses informatics for the quantitative aspects of their research, probably does not feel to be a 'digital historian', or a 'digital humanist'. Despite the current aspirations to reach post-disciplinarity, individual disciplines are still alive and effective, even though their mutual boundaries are becoming less rigid, and keep absorbing the relevant technological innovations as they always did. DH, in turn, can be considered as a newly introduced discipline, different from literary studies, linguistics, history and whatever else, but it is perhaps the best place where the whole humanities can effectively exercise that "ability to listen to one another, willingness to learn from one another" mentioned above and suitable, in our opinion, to form the most appropriate definition of transdisciplinarity.

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