Humanistic Research, Information Resources and Electronic Communication

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> …there are two kinds of scientists - physicists … and stamp collectors.
>
> (attributed to Lord Rutherford)

The purpose of this paper is to illustrate in what ways electronic communication, and the use of information in the humanities, differs from the practice of "hard" sciences, and to identify issues and problems that need to be tackled in that respect. It argues that the humanities form a challenging and potentially rewarding field for electronic communication, with requirements that are directly dependent upon the methodologies, intellectual traditions and practices of its constituent disciplines. It benefits from the views expressed in several recent reports, summarising the effects of information technology on arts and humanities research, and reflecting the urgency of establishing priorities in this field.[1]

Nature of humanistic research

A recent report, reflecting on the application of information technology in the humanities, notes:

> "the exceptionally varied nature of humanistic study, an often loose coalition of disciplines that can include philosophy and some schools of sociology, anthropology and music, fine arts and the history of technology, and even some aspects of environmental studies. Cultural institutions such as museums and libraries are also included in the humanities purview. This realm of intellectual pursuit was deemed antithetical to precise, mathematical computing applications ".[2]

There are significant traits that occur consistently across the "loose coalition" of humanistic disciplines:

1. Humanistic research is often hermeneutic, dealing with complex, agglomerative structures of argument manifested in the *corpus* of earlier scholarship, rather than experimental, dealing directly with the empirical domain viewed as a closed system;

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[1] Mullings, 1992; Association of Research Libraries, 1992; Feeney and Ross, 1993; Burnard and Short, 1994; Getty AHIP, 1996; ACLS Newsletter, 1997; Pavliscak et al., 1997; CSTB/NRC, 1998. For a comprehensive treatment of the impact of electronic publishing on the academic community, the reader is directed to the publication of the recent Academia Europaea symposium, which appeared too late to be taken into account in the current discussion (Butterworth, 1998).
[2] CSTB/CSR, 1998.

2. It is, as a rule, narrative, textual and rhetorical; value-laden and judgmental (as, for instance, in historical disciplines); and idiographic – interested in individual facts or stories – rather than nomothetic;

3. In the humanities, arguments cannot be reduced to formal syllogisms (laws, explanations), as prescribed in positivism. On the contrary, a central question is often "what is?". From language studies to history and archaeology, descriptions do matter in humanistic research, often more than explanations. As noted by Grabar , "establishing facts depends on clear and known procedures, which become the object of training to enter any field in the humanities";[3]

4. Humanistic research is situated in the practice of the isolated, Humboldtian author, and its practitioners acquire their skills through apprenticeship, rather than adherence to a methodology – a fact leading some authors to label this form of research "intuitive rather than deductive".[4] Thus, becoming a humanist requires, typically, being exposed to the practice of research, in addition to the assimilation of "facts" or a body of knowledge.

Other authors have reached similar conclusions. As noted by Kolker and Schneiderman "humanities research is only occasionally carried on by teams or under the rubric of a collective project"; Arms adds the difficulty that humanists have in "seeing themselves as leaders of research teams and … accepting the constraints of teamwork". Marchionini recalls that "humanities scholars do not look for answers to well-defined questions but rather [they] elaborate threads of discourse".[5]

Bearman, on the other hand, summarising the views of a colloquium of prominent humanists, notes that the humanities may be viewed as symbolic systems (with their own language, representation conventions, and ways of thinking), and suggests that deeper commonalities and differences, at the epistemic level, may be usefully sought. He quotes online comments by Nora Sabelli (NSF) and Sha Xin Wei (Stanford) highlighting the importance of "broadly defined styles of reasoning and argumentation" in the humanities (descriptive, logico-deductive, dialectic), "rather than narrow, discipline-specific methods".[6] On a similar level of abstraction, Gardin, in a less polemical vein than in his earlier logicist work,[7] acknowledges the coexistence of a "scientific" and a "narrative" mode of thought in the humanities, and calls for their integration within a "new vision of scholarship".[8]

The epistemic difference between the humanities and those sciences more amenable to com-

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[3] Grabar, 1993.
[4] Kolker and Schneiderman, 1996.
[5] ibidem; Arms 1993; Marchionini 1996.
[6] Bearman 1996.
[7] Gardin 1980.
[8] Gardin 1994.

puting applications is, in fact, noted in the collective report mentioned above.[9] It is explained, mainly, in terms of the heterogeneity between the humanistic disciplines enumerated, and the blurred line separating these disciplines and cultural institutions in the broader sense. I shall refer to the epistemic and the social aspect of the humanities in the following section.

A conceptualisation of scientific practice, illustrating the methodological differences of the human from the natural sciences, has been systematised by Bhaskar.[10] According to Bhaskar's "critical naturalism", social science illuminates the social relations within which individuals and groups stand,[11] and, thus, moves from the manifest phenomena of social life, especially as conceptualised in the experience of the social agents concerned, to the essential relations that necessitate them.[12] According to his approach, explanation of past events, central to the humanities, is sharply asymmetrical to prediction, central to the experimental sciences, and the humanistic research process may be described in terms of the following steps:

1. Identification of the activity or product to be explained, and resolution into elements,

2. Re-description of these elements in terms of the "language" of the discipline at hand,

3. Retroductive attempt to describe the likely structural conditions and tendencies involved, and

4. Elimination of alternative possible causes of the original elements, identified at the first phase.

The scheme, distinguishing between the empirical and the real (i.e. the notions describing the non-observable *essence* of the field at hand), and placing emphasis on the contextual discussion of alternative interpretations and theories (i.e., the body of scholarship), fits better with the practice of research in the humanities, than the positivist scheme prevalent in the natural sciences.

The coupling between humanities and cultural institutions is based on the fact that the focus of the former is the study of "cultural objects" (material or intellectual), i.e. entities made by, or instrumental to, human agency, as well as information, commentary and interpretations of such objects, and relationships between them.[13] There is, however, a deeper aspect of the dependence between humanistic research and society. According to an intellectualist agenda, dominant since the time of Aristotle, humanistic research, unlike some other forms of human enquiry, is not pursued for its own sake, but in order to contribute to society. Humanistic scholarship is, thus, intimately linked with an educational mission, linked to the public good: i.e. to develop educated citizens, whose knowledge about the past, history, culture, etc., is

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[9] CSTB/NRC, 1998.
[10] Bhaskar 1979; cf. Gibbon, 1989 for its application to contemporary archaeology.
[11] Bhaskar, 1979, p. 39.
[12] Gibbon 1989, p. 161.
[13] Hockey, 1996.

deemed to be a desirable, and possibly necessary, aspect of their civic existence. Considering the increased financial pressures facing the arts and humanities, this is not just a noble moral consideration: "If we only, or even primarily, write for each other", an American humanist notes soberly, "we may find ourselves with no research fellowships, no library budgets, no students and no field".[14]

The impact of information technology

The information revolution, brought about by advances in computing and telecommunications technology was, and still is, received with mixed feelings by humanists. In the words of a traditional art historian, "the humanist-scholar's world is that of silent libraries and collections beautifully run by diligent but quiet attendants and of peaceful home studies lined with books and images". New discoveries only seldom change drastically the humanists' universe of knowledge, so that it is very natural for a classicist, asked by a physicist: "And what is new in your field?" to respond "Nothing, I hope".[15]

There is a perception, here, that the essence of humanistic research is threatened by the "transformation of library catalogues into video machines. The old gesture of flipping cards, which made one feel in professional partnership with centuries of humanistic knowledge, disappeared".[16] On the other hand, the futility of ignoring the effect of new technologies available to scholars on the way of doing research is asserted by one of the pioneers of humanities computing: "Just last week, I had a Marxist literary scholar saying to me words that quite unconsciously and quite faithfully echoed the lament of a 15th century Benedictine abbot for the threatened decay of the medieval scriptorium".[17] In the words of another humanities computing pioneer:

> … either [humanists] are portrayed as poor suppliants at the industrial/scientific banquet, or the introduction of computing into humanistic scholarship is viewed as the incursion of an essentially foreign, possibly inimical force. The truth is, however, that poets and philosophers have been thinking and dreaming about automata (the general class to which computers belong) at least since Homer. It is only within the last few years that computers have become sophisticated enough even to begin to handle our data and so be worthy of our attention.[18]

In fact, electronic communication and the use of information resources in the humanities cannot, and should not, be divorced from the impact of information technology on their methodology and theory. According to Manoff, "computers do not simply increase access to scholarly material. They reshape the objects of study, alter research possibilities and even begin to redefine what constitutes research". As noted by Feeney and Ross, "transformation of the

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[14] Crane, 1998.
[15] Grabar, 1993.
[16] Ibidem.
[17] O'Donnell, 1994.
[18] McCarty, 1997.

source material into a database requires deep understanding of its structure and nature and thus constitutes a major intellectual achievement".[19]

As recognised by Anthony Kenny, apart from "humdrum" research, leaving no visible trace in published work, and "showpiece" projects, noticed more in computer science than in the humanities proper, there is an increasing body of arts and humanities studies, respected in their own field, which could not have been achieved without a computer.[20] Stylometric studies of original texts demonstrate, for instance, that the Apocalypse cannot be by the same author as St John's Gospel; they have been used to identify the real author of the Federalist papers; they helped elucidate the disputed chronology of several dialogues by Plato. Matching earlier developments in social science, the development of digital resources, such as the *Prosopography of the Byzantine Empire (641-1260)*, produced by the British Academy, has allowed Byzantinists to pose questions hitherto impossible with traditional corpora.[21]

Museums, special collections and libraries play a central part in the practice of humanistic research, as important as the laboratory is for experimental science. It, thus, comes as no surprise that management of information traditionally stored in libraries, archives or museums, constitutes a major application of information technology in the humanities. Important projects include textual archives, archaeological data archives, art historical corpora and image bases.[22]

A model initiative, illustrating the potential of using computers for scholarship, is *Perseus,* a digital library on ancient Greece.[23] *Perseus* uses the Text Encoding Initiative SGML DTD's for the structuring and conversion of a large number of ancient Greek texts (lacking, as yet, variants and critical commentary) and their English translations. It provides sophisticated morphological analysis software for the lemmatisation of ancient Greek words in the texts included, which are then linked to the standard 9th edition of the *Liddell-Scott* Greek-English dictionary and its updated *Shorter LSJ* version. Ancient texts are integrated with a broad collection of photographs of Greek art and architecture, architectural plans and drawings, and even animations, programmed in the *Java* language, e.g. to illustrate the proofs in Euclid's *Elements*. Printed and electronic courseware, cross-referenced with *Perseus* texts, images and

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[19] Manoff, 1997; Feeney and Ross 1993, concerning the creation of a digital information resource in the humanities.

[20] Ibidem.

[21] E.g. to find all bishops whose brothers were also bishops, Feeney and Ross, 1993.

[22] E.g., the *Thesaurus Linguae Graecae* of the University of California (Irvine), the *Oxford Text Archive,* and the *British National Corpus;* the *National Monuments Record* of the Royal Commission for Historic Monuments and Sites of England; the *Dante Gabriel Rossetti Hypermedia Project* of Virginia University, and the *Museum Educational Site Licensing* project, bringing together digital art resources from American museums for educational use by participating universities (Kenny, 1992; Feeney and Ross, 1993; Pavliscak *et al.,* 1997).

[23] Developed by a multi-disciplinary team of humanists and scientists originally in Harvard, and now in Tufts University (Crane, 1996; Crane, 1998).

data, are already making their appearance, and the system is used as a learning resource in more than 50 academic courses.[24]

As its creators conclude, *Perseus* is equally useful for serious research as for education,

> not only [helping] traditional scholars conduct their research more effectively, but, more importantly, [helping] humanists use the technology to redefine the relationship between their work and the broader intellectual community. … [Future plans concentrate on] exploring publications not feasible in print; … the ability to publish detailed [archaeological] 3D models, VRML walk-throughs, databases of objects, detailed surveys, and simply thousands of color pictures (instead of dozens of B&W illustrations) all open up major possibilities.[25]

Cultural information objects

As noted above, humanistic research is concerned with cultural objects, as defined in terms of a scholarly "language", i.e. the set of theoretical terms and relationships within a given discipline, such as archaeology, history, art history, etc., used for the description and interpretation of the empirical domain of the discipline. The set of notions is expressed in terms of a given discipline, as well as in propositions involving these terms; regarding the empirical domain, they constitute, in fact, an information universe, on which humanistic research operates and, conversely, which is produced by humanistic research.

The cultural information universe consists, thus, of information objects modelling actual cultural objects (literary texts, artworks, artefacts, historical records, and the like), their histories, persons and organisations operating on such objects, and their relationships. It also encompasses theories, interpretations and opinions about such objects. Unlike what happens in the sciences, the value of cultural information does not decrease with time; on the contrary, as noted with regard to cultural heritage and museum information, there seems to be a persistence of "old knowledge" and a dependence of humanistic scholarship on relatively static information resources, such as corpora.[26] Scholars often return to the re-interpretation of older published opinions; it could be claimed, in fact, that "legacy" research in the humanities retains its importance, in a manner unthought of in the natural sciences.

The use of this cultural information universe is dominated by the need to support sophisticated subject access. Since the empirical domain of human action and its results can be studied from alternative viewpoints and disciplinary traditions, access to information is conditioned by overlapping, often inconsistent terminologies. Given the narrative, textual and rhetorical aspects of humanistic research, referred to above, language itself becomes an additional, important factor in the modelling of the information universe.

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[24] Perseus Project, 1996.
[25] Crane, 1998. This includes, for instance, Neil Smith's GIS application, incorporating a database of toponyms with coordinates from Ptolemy's *Geography,* and allowing visualisation of that author's view of ancient geography.
[26] Dallas, 1994.

Fox challenges the popular assumption that cultural information objects somehow lack structure: "… what is called unstructured information … is not really unstructured: an example is the book, which along with other kinds of literary works has tremendous structure. We call them unstructured because we do not know how to deal with them properly".[27] The same is true of other kinds of cultural information, such as iconographies, the results of archaeological excavation, or historical narrative. In fact, it is the complexity, rather than the lack of structure of cultural information that accounts for the limited use of computer-based methods in the past: "It is only within the last few years that computers have become sophisticated enough even to begin to handle our data".[28]

A number of different aspects of complexity were identified in a discussion of material culture information, notably museum objects, such as artworks and archaeological artefacts:

1. Specialisation/generalisation, namely, that museum objects are, as a rule, heterogeneous and can only be defined adequately as members of a class hierarchy, prescribing different traits for each constituent class. In addition, "since material culture can be described on the basis of at least the three essential dimensions of form, function and meaning … it is common to find … classes or individual objects belonging to more than one class", pointing at a *multiple* specialisation relationship;

2. Part aggregation or composition, namely, that "adequate description of composite objects … requires the specification of named object parts … which should be identified and described in their turn";

3. Temporality, namely, that information on objects is time-specific, whereby time is often denoted by time intervals, bounded in an inexact manner, or even by temporal relations such as "before" and "between";

4. Spatiality, as regards both geographic space and its relationship with the provenance or location of objects, and the spatial structure of the objects proper;

5. Conceptual relationships, with notions such as ideas and themes, which are separate from the physical identity and representation of objects;

6. Frequency of partial and missing data, which may imply that a pertinent part of the object is missing, that a trait is not applicable, or, simply, that a trait has not been recorded for the object at hand;

7. Subjectivity and context dependency, accentuated by the fact that even major dimensions of an object's description (such as the artist or style) is, firstly, a classification based on informed judgement, rather than an objective fact, and, secondly, can only be determined using names and terminologies depending on cultural context and scholarly tradition;

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[27] Quoted in CSTB/NRC, 1998.
[28] McCarty, 1997.

8.   And multimediality and textuality, introducing, by virtue of the co-existence of different kinds of information, overlapping layers of data representation requirements.[29]

Such aspects of complexity may be valid across the broader domain of cultural information in general. In fact, Bearman records the shared view that "disciplinary diversity, complexity of knowledge representation, variability in expression, historicity, textuality, cumulativeness, and genre dependence" are constituent traits of the arts and humanities (as against the sciences).[30] He is quick to note that the general validity of some of these assumptions may be challenged in practice, but acknowledges the importance of "multiple intellectual perspectives" conditioning cultural information;[31] the "concept of derivation as new creation" for humanistic writing;[32] the need to understand old sources as originally conceived; and, the "overlays [of argument] as created by commentary built up over time", across the broad spectrum of humanistic disciplines.[33]

As suggested by Dallas, museum "information system[s should encompass] not only inventory registers, card records and indexes, but also a large collection of research notes, realised exhibition layouts, catalogues and published texts."[34] Supported by empirical research in the Science and Industry Museum at Manchester, Hemmings *et al.* note the importance of the "sense of order" in a collection for the generation of alternative interpretations, and add:

> The practiced eye of the curator can 'see' how [the] material could be potentially re-organised as a display item or as a 'fileable' resource … the sorting and classifying of the material is done with an eye to the story that can be told.[35]

This conforms with the view that physical arrangements of "collections … represent, in fact, cultural classifications of artefacts". Conversely, "[t]hesauri and controlled vocabularies constitute conceptual organisations of the subject-domain" itself.[36]

Given its heterogeneity and complexity, "humanistic evidence is not easily categorised and entered into a relational database and not readily subjected to quantitative measure or statistical analysis".[37] As Hockey points out, "it took many years to begin to understand some of the differences between representing knowledge that is intended only to be read, and representing knowledge that can be processed electronically in different ways".[38] The massive production of increasingly specialised human science publications introduces new modes of information

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[29] Dallas, 1992b; idem, 1994.
[30] Bearman,1996.
[31] Hockey, 1996.
[32] Marchionini, 1996.
[33] Bearman, ibidem.
[34] Ibidem.
[35] Hemmings *et al.,* 1997.
[36] Dallas, 1994.
[37] Manoff, 1997.
[38] Hockey, 1996.

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usage: "no-one expects us to *read* that stuff; 'consult' is the better concept".[39]

Using information resources

The broad universe of secondary sources, scholarly texts, interpretative structures, informal opinion, as well as primary evidence, can be said to constitute the *information system* of humanistic scholarship at large: thus, sources become resources for scholarship.[40] Burnard and Short provide a comprehensive account of perceived needs in the area of arts and humanities computing, with reference to information resources and their use in particular. In their study, which was the blueprint for the establishment of the Arts and Humanities Data Service in Britain, the resource life-cycle is identified in terms of four stages, each giving rise to different requirements for action:

1. Resource creation (needs for academic quality, copyright, design standards, reusability and access, resource identification and description, technical description, user guidelines);

2. Resource management (needs with respect to basic procedures, information content - e.g. integrity, version control/intellectual history of resources, physical access, conditions of use, intellectual property rights, charging, platform dependencies);

3. Resource preservation (procedures, media);

4. Resource dissemination and discovery (delivery platforms, communications infrastructure, catalogues and indexes, gateways, service reliability, documentation, training and user support, resource discovery tools and relevant documentation and training).[41]

Access to cultural information resources falls within the purview of the fourth stage of the resource life cycle. It calls for support for "a variety of parallel classification schemata, search pathways and … interrogation techniques".[42] Four functions become critical in this context: resource identification, where humanists are needed to guide the construction of domain ontologies relevant to humanistic knowledge; analysis, where, for example, tools for identifying similar visual works are erratic and primitive; collaboration and re-creation, where the intrinsic bias of computing in favour of collaborative work challenges the norm of the solitary humanist; and, dissemination, where new opportunities are intertwined with new problems.[43]

In fact, two complementary modes of information-seeking can be distinguished. Firstly, *search*, an analytical information seeking strategy whereby the researcher wishes to locate objects in the information universe on the basis of specific, known properties. Secondly, *dis-*

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[39] Gardin, 1994.
[40] Grabar, 1993.
[41] Burnard and Short, 1994.
[42] Hemmings *et al.,* 1997.
[43] Garrett, 1996.

covery, a browsing information-seeking strategy, whereby the researcher explores some promising information space for objects with yet under-specified or unknown properties.[44]

Given the traits of humanities discussed above, it should come as no surprise that the strategy of *discovery* is very common in humanistic research. As noted by Garrett, enhanced access "focuses on a dialogue between the user and a set of information resources ... the information resource provides a framework for initial exchanges, which may result in new or transformed resources that may initiate new discussions";[45] the *discovery* process involves, actually, this dynamic redefinition of the focus of the enquiry, by means of the successive opening and closing of the information funnel. New developments in information technology, such as the emergence of hypermedia, object-oriented and semantic information systems, with their support for dynamic structuring and browsing of densely connected information structures, blur the boundaries between *search* and *discovery*, and open up the possibility of such an enhanced model of access.

Support for alternative perspectives to the information universe, or *points of view,* as they are known from a project initiated by the Getty Information Institute, aiming to define identification and search criteria used by different categories of users, is an important requirement in humanistic resource access. Besides, "[s]ince it is likely that we will see the continued development of independent, non-standard collections of information – each a uniquely organised expression celebrating human innovation and creativity – it makes sense that these collections themselves should become subject to study, critique and interpretation".[46]

The shift of emphasis from a prescriptive to a descriptive approach, and from the data instance to the database structure level, affects both cataloguing (or annotation) of cultural information resources, and the representation of their content. As regards the former, it is worth noting the work on metadata standards by the Arts and Humanities Data Service in the UK, covering a broad spectrum of cultural resources, including literary texts, archaeological data, museum objects, musical scores, etc. As regards the latter, a typical example of emerging trends is the Object-Oriented Reference Model for museum information, currently developed by the Data Standards Working Group of CIDOC.[47]

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[44] Marchionini, 1996.
[45] Garrett, 1996.
[46] Marchionini, 1996.
[47] A tool used for its development is the *Semantic Index System,* developed in Crete by the Institute of Computer Science, FORTH, and it has also been used to develop several other cultural heritage applications: the Benaki Museum information system (*MITOS/CLIO*), the National Monuments Records inventory of Greece (*Polemon*), the prototype for the *Thesaurus Management Tool* of the Getty Information Institute, the Turkish Archive of Chania information system, etc.

Visual collections as resources

Visual collections and materials (slide libraries, illustrations in textbooks, etc.) are of paramount importance for research and education in humanistic disciplines such as archaeology and art history. However, while teaching in these disciplines is mostly based on images, their use in student work (such as term papers) and examinations, typically restricted to textual expression, is marginalised. Visual illustrations in publications are, as a rule, selective, due to the high cost of reproduction of high-quality illustrations; on the other hand, the scarcity of digital reference collections, which are often under-used and inaccessible to many in their non-electronic form, remains a major problem. Besides, visual materials are still only minimally used in humanistic disciplines such as literature, or in the social sciences despite their potential to complement textual sources as evidence, and thus open new possibilities for research.

Lynch notes the breadth and potential of visual sources in existing publications, and stresses the need to deal with them as resources in their own right. He suggests cataloguing individual images (e.g. illustrations of a book, slides in a teaching collection) a) in the same way as cataloguing articles in journals, and, b) as parts of reference databases of images and their descriptions.[48] These resources could be accessible *via* a " scholar's workstation … provid[ing] tools which allow the user to analyse digital images, combine them in different ways, create new juxtapositions, and explore scholarly text-based information".[49]

The use of digital visual resources for research and education as "surrogates" of primary cultural objects (artworks, artefacts, visual records) introduces significant requirements regarding quality of information. Trant stresses the need to achieve consensus for the adoption of standards, which will govern the creation and retro-conversion process for digital images; otherwise, she adds, it will not possible for scholars to assess their informational content and judge their fitness as evidence in the research process. This becomes essential with the emergence of a wide variety of informal and "grey" sources of visual material, notably on the Internet: "Contrasting information from such informal sources with that offered by institutions about their own collections, in sites such as that of the National Museum of American Art, raises significant questions about the source of visual information, its authenticity, and level of accuracy.[50]

The emergence of distributed image resources begs the issue of image retrieval across collections, ensuring predictability and effective resource discovery. The *Cultural Heritage Information Online* experiment, conducted by the *Computer Interchange of Museum Information (CIMI)* consortium, as well as the prototypes developed by the *RAMA* and *Aquarelle* projects,

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[48] Lynch, 1997.
[49] Besser, 1996.
[50] Trant, 1997.

partially funded by the European Commission, point to the possibilities opened by multipoint access to visual collections. The *Museum Educational Site Licensing (MESL)* project, on the other hand, brings digital representations of images from several museums and visual collections together in a single visual resource, and makes them available to participating universities for educational use; interesting questions on the utility of digital visual resources in general are raised by experimentation in the University of Maryland, where art studio students created new visual works, on the basis of descriptions supplied by art history students who had access to *MESL* digital images and their documentation.

The need to ensure adequate formal representation of the content of images, such as artworks, raises issues such as the spatial and topological relationships between image elements, the "grammatical" nature of image compositions, and the expression of iconographic, stylistic and other meaning-bearing codes and conventions which govern them.[51] Besides, effective use of visual resources for research depends on support for a "visual thinking model", stimulated by the use of images (e.g., thumbnail indexes and initial visual cues) in the discovery process, and using image similarity as an important mechanism for search.[52]

Electronic communication

Despite the "increasing will amongst humanists to change information and communication practices as a positive reaction to the potential of technology", the picture derived from a study of the impact of information technology on the British arts and humanities is "not one of widespread use of new technology, but rather one of peaks and troughs".[53] The uneven spread of electronic communication in the humanities, still predominant today, is linked with declining funding for the humanities and with increasing pressure to ensure the preservation of precious information resources (such as *incunabula,* artworks and archaeological artefacts). It is also linked, however, with the ambivalent attitude of humanists towards information technology, and the differences in attitudes and approaches between humanists and natural scientists, on whose needs the functionality of existing electronic communication systems have been modelled to a greater or lesser extent.

Harrisson *et al.* note that "[i]n many humanities and social science disciplines, informal communication may play a greater role in generating ideas than disseminating information

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[51] Dallas, 1992a.

[52] Romer, 1996. Among Romer's other recommendations, one is worth noting the need to develop a framework for *points of view* for image discovery, to evaluate the possibility of converting hierarchical vocabulary resources (such as the Art and Architecture Thesaurus and the Library of Congress Thesaurus for Graphic Materials) into semantic networks, to use media differentiators, and to develop visual thesauri, "having an image point to its visual 'synonym' " and, thus, further stimulating visual reasoning.

[53] Feeney and Ross, 1993.

about research in progress". In a similar vein, Valauskas states:

> Clearly, scholarly communication in high-energy physics is quite a different matter than say the discussions of two paleontologists over the evolutionary history of a trilobite; the disagreements between two lawyers over an interpretation of moral rights; the interpretation of Picasso's Guernica by several art historians.[54]

This assertion, linking the methods and traditions of humanistic research with the particularities of cultural information objects, resources and media, discussed above, is supported by an examination of specific genres of electronic communication in the humanities, such as the following:

1. Research archives, corpora and image bases

2. Books, monographs and journals

3. "Grey" literature

4. Bibliographies, indexes, abstracts and search tools

5. Electronic mail, discussion lists, workgroups, etc.

The dependence of the humanities on primary resources, such as research archives, textual corpora and image collections, and the particular requirements for humanistic research has been discussed in the previous sections. As pointed out by McCarty,[55] arts and humanities scholars are "compulsive publishers", who may benefit greatly from the scholarly communication opportunities afforded by information technology. However, the emergence of electronic journals in mathematics, the natural sciences and the technological disciplines finds no match in the humanities: out of the first ten electronic journals in terms of circulation, from 1993 to 1996, only one (*Postmodern Culture, PMC)* belongs to the humanities.[56]

This may be explained by the fact by the tradition in the arts and humanities, according to which "journal article publication is itself viewed as a less important contribution to knowledge than publication of a book … In such disciplines, electronic journals may never achieve the credibility of print".[57] In fact, the reason why monographs and syntheses constitute a major outlet for humanistic research is not just academic habit: the inter-textual nature of humanistic argument, its dependence on the citation of primary evidence, and the longevity of humanistic knowledge, discussed above, makes them an appropriate publication format for many instances of humanistic research. Humanistic monographs and syntheses have a longer pre-publication period and remain of interest for longer times after publication; they can support a dense structure of references to their research context (through footnotes, endnotes and indices), and be supplemented by primary sources, catalogues and illustrations integral to

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[54] Harrisson *et al.,* 1991; Valauskas, 1997.
[55] Quoted in CSTB/NRC, 1998
[56] Harter, 1996.
[57] Harrisson *et al.,* 1991.

their argumentation. As noted by Arnold, university publishing centres could undertake the publication of electronic monographs, which, by virtue of the electronic medium, would be more like "a cluster of related materials, which can be examined independently, than [resemble] printed books."[58]

There are, however, exceptions: for instance, review journals, where timely dissemination of information is clearly of prime importance. As the editor of the *Bryn Mawr Classical Review* (and its twin publication, *Bryn Mawr Medieval Review*) confirms, "[t]he University of Virginia Library tells us that we are regularly either the most or the second most frequently accessed electronic resource on their server". The version of *BMCR* distributed by electronic mail had, at the time, more than 1000 subscribers, a number that has probably risen by now. O'Donnell emphasises the fact that the journal, which is freely available, is produced by more than two hundred volunteer contributors, at what he calls "trivial net dollar costs … without further burdening the acquisitions budgets of libraries or threatening a traditional publisher with a deficit". He adds:

> The success of *BMCR* has been rooted in the fact that it started with a good, but very old-fashioned, editorial judgment: that there was a place for this particular vision of a periodical, and that we had the resources to put it together. We did not begin … as an experiment or a demonstration; we didn't think it would be nice to have an e-journal, and so try to whomp one together. We knew that book reviews came out too slowly and through too few channels in our field, and we knew that we had a network of friends and colleagues (an important nucleus was built up through our earlier desktop publishing experience with *Bryn Mawr Commentaries*) who would respond and write for us.[59]

Its success is due to a conservative approach, sensitive to the needs and attitudes of its Classicist readers. This is not surprising, if one considers that, even in the case of the very successful *Journal of Artificial Intelligence Research (JAIR),* editors had to adopt the visual style of a traditional paper journal, in order to earn the trust of computer scientists who constitute its readership.[60]

Internet Archaeology, the first peer-reviewed electronic journal in archaeology, built a subscription list of about 1600 by its first issue, published in 1996, following a different approach. Its creators, archaeologists from a consortium of British universities, attempt explicitly to go beyond the basic functionality of print journals, providing facilities only available in an electronic medium. They envisage:

> a model of archaeological research supported by the widespread availability of archaeological research archives, that organise the results of both excavation and post-excavation work into an accessible resource for other researchers. These electronic datasets would be managed by data banks, including archaeological data repositories such as the *Archaeology Data Service* in the UK … or, in the least desirable circumstances, by individual researchers. Arguments pre-

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[58] Arnold, 1992.
[59] O' Donnell, 1994.
[60] Langston, 1996.

sented in papers would then be enhanced with "live" views of data deposited in research archives, and subjected to a far greater degree of peer review based on access to the empirical statements supporting the author's analyses. Readers would be able, by means of outlines and hypertext links, to grasp the overall relationship between arguments, follow the main analysis in a logical manner, and branch off to explore more detailed issues and secondary arguments.[61]

Several papers, providing the theoretical basis for the *Internet Archaeology* model, have been published by its originators. Richards discusses the problems of proliferation of archaeological information, the imperative of "preservation by record" of evidence destroyed through excavation or destruction, the increased ways of reading and searching such data, the need to use tools, both generic (e.g. graph representations of the structure of hyperdocuments) and specific to archaeology (e.g. maps and plans as entry points, stratigraphic matrices) in electronic publication.[62]

Issues of *Internet Archaeology* published so far include both theoretical and methodological contributions, and data-oriented research, i.e. fieldwork and excavation reports, artefact studies, discussions of specific archaeological problems, even a thesis-length paper.[63] In the case of *Internet Archaeology*, most papers – even longer ones – were read online, a fact suggesting that readers did not treat the electronic medium as just a convenience for document dispatch, but valued the database search and summarisation facilities offered by the journal.[64]

As pointed out by Richards, electronic publishing is less suited for the traditional linear consumption of scholarly argument than for a "cognitive learning" approach, an open investigation of sources and arguments empowering the reader. Gardin, on the other hand, experimented with rephrasing a twelve-page long archaeological article, written in the traditional textual form, into a two-page schematisation, "a table containing all … propositions that have explicit antecedents in the text (descriptions, analogies, supposedly established facts), then a diagram", showing the derivation paths to the final propositions. He reports that this version of the article, summarising a deeply nested structure of propositions and their warrants, is more amenable to being "looked up" or "consulted"; however, some commentators felt that something was lost in the process, or that the shorter paper was difficult to read. Electronic publication could, in fact, provide tools to combine the "structural" view of argument with its "textual" expression, overcoming these difficulties.[65]

The circulation of electronic journals, such as those presented above, and their citation im-

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[61] Dallas, 1997.
[62] Richards, 1994.
[63] A log file and registration data analysis, conducted by Vince *et al.* (1997), showed that readers accessed papers in a non-linear fashion, looking first at the summary, then the table of contents and the list of illustrations, and then browsing freely through a section of interest; in fact, Vince's suspicion that this is the usual pattern for reading print publications as well is confirmed by Dillon (1996).
[64] Dallas, ibidem.
[65] Gardin, 1994.

pact, is still disappointingly low in the arts and humanities compared to the sciences. In fact, in the humanities "the printed word is still the main means of … communication, the ultimate goal of all … endeavour, and a measure of personal achievement.".[66] Ease of distribution and lower cost for ample photographic illustration, sometimes sorely needed, may not be adequate factors for change; thus, it may be argued that the success of electronic publications in humanistic research will depend on their ability to go beyond print, and provide readers with:

1. Interactive access to the data and primary resources related to the research presented, so that readers may change parameters and review statistical and graphical summaries of the information;

2. Visualisations and summaries of the structure of arguments presented, i.e. the structure of the research problem at hand;

3. Support for structured documents, so that alternative forms of the text can be viewed, different global views can be used for orientation, and its logical structure can be selectively expanded or collapsed;

4. Active links to cited research, as electronic publication becomes more widespread, so that readers are spared the long hours of checking references from the library shelves.

Preprints, "an advance form of a paper in the process of development for publication or in the process of editorial review",[67] represents an extremely successful application area for electronic publication, as shown by Paul Ginsparg's physics preprints archive.[68] It should be noted, however, that physics is a field where large teams of researchers (sometimes more than one thousand) need to co-operate; there is a need for extremely fast communication of discoveries; and, there were technical skills and resources available to develop the project. Given the altogether different nature of most humanistic research, it comes as no surprise that preprints are not common, in paper or electronic form. Although new "private electronic presses" may be created, it will not be easy for writers in the arts and humanities to develop the complex editorial, legal, production and other skills that publishers offer; thus traditional publication may remain the main outlet of humanistic research, emulated, but not replaced by electronic publication.[69]

Nevertheless, the growth of the Internet, and especially of the World Wide Web, has had a remarkable effect on the sheer quantity of "grey" electronic resources, relevant to the humanities. These resources, frequently intended for a general, or for an educational public, sometimes put together by amateurs rather than professional humanists, show a wide variety in terms of scholarly validity, quality of presentation and cultural interest. They represent, so to

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[66] Richards, 1994.
[67] Valauskas, 1997.
[68] Ginsparg, 1994.
[69] McCarty, 1997.

speak, the "beetles and vans" of the information superhighway, which, as noted by Okerson, should not be neglected by libraries, but should be studied, indexed and made available to the research community.[70] The ease of self-publishing associated with the World Wide Web allows, for instance, the sharing of "grey" information – falling between a formal archive and a researcher's informal notes – as envisaged by Joyce, Phoebe Hearst Museum director:

> So now I have a massive table that systematically records attributes for manufacture, dimensions, costume, pose, etc. … for about 135 figurines. It would be great if I could put this table up … and have the Peabody link to it so other scholars could use the data. Then multiply that by all the people doing the same for subsets of collections and you have my vision.[71]

The potential of enhancing scholarly research, as well as transforming the role of institutions such as museums by means of "grey" online resources, is matched, however, by the extent of misinformation and the lack of authenticated authority associated with World Wide Web publication. History and archaeology are particular sufferers in this context; as noted by Hoopes, "...mystical prophecies about a hidden Hall of Records at Giza and New Age theories about pyramid power ... predominate". Indeed, many cultural heritage WWW sites "occupy an odd, unfocused realm between fact, fantasy and satire", not countered effectively by what in the past has been the "unassailable voice" of museums as sole guardians and warrantors of truth in matters regarding cultural heritage.

In fact, by their very existence in the grey area between science and popular culture, cultural information resources subvert the definition of traditional notions of authority and trust. It cannot fail to surprise a humanist, for instance, that the success of archaeological and cultural titles in the multimedia market today is, apparently, almost independent of the scholarly authority invested in the development of their content, as shown by the fact that authorship information is well-hidden in the credits screen of the software rather than promoted on the sleeve or front page.

Researchers attempting to use the World Wide Web for serious research run up against a proliferation of low-quality information. An interesting approach to countering this problem, emulating the selection process effected by the accession policy of libraries, is demonstrated by *Argos,* the first limited-area search engine indexing ancient and medieval resources on the World Wide Web. *Argos* indexes only those links that are listed in trusted metapages, maintained by accredited research and educational institutions (including museums and libraries) and individuals. In addition, *Argos* reviewers rank listed sites according to interest, in order to aid users in using effectively the search results (a similar reviewing service, of much broader coverage, is offered by the *Encyclopaedia Britannica* for World Wide Web sites). *Argos* typically yields more useful results than generic search engines, such as *Altavista* or *Lycos*.

Humanistic vocabulary resources, such as glossaries and thesauri, encapsulate significant

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[70] Okerson, 1994.
[71] R. Joyce, quoted in Hoopes, 1997.

amounts of contextual knowledge. For instance, the *Thesaurus of Geographic Names,* published by the *Getty Information Institute (GII)*, contains knowledge about the names and geographic inclusion relationships between a vast number of entities, such as settlements, rivers, or regions. The *a.k.a.* ("also known as") Web application, also developed by the *GII,* uses the Institute's *Art and Architecture Thesaurus* and *Union List of Artist Names* in order to achieve better results in searching for references in the *Avery Index, RILA,* and the *Provenance Index.* To do so, the application first resolves and expands terms specified in the search according to their terminological equivalence and inclusion relationships in the two thesauri.

The *a.k.a* project was developed in response to an evaluation experiment, conducted between 1990 and 1996; the experiment showed that humanities scholars visiting the *Getty Center for the Humanities* made very little use of the *DIALOG* bibliographic service, despite extensive training by Getty staff and the offer of free online time.[72] While scientists and social scientists used almost exclusively common terms in their bibliographic searches, more than two thirds of the terms used by humanists were, in fact, proper names – personal, geographical, chronological or discipline-specific.[73] The limited interest of arts and humanities scholars may be explained, in part, by *DIALOG'*s arcane interface, as well as its limited coverage of humanistic resources, especially European and early literature, and total lack of coverage for primary sources.[74] However, the fact that scholars used the service very rarely to search within their core expertise area underscores a different factor, related to the hermeneutic and inter-textual nature of the humanities.[75]

Scholarly communication, however, is not limited to accessing "passive" information resources, published and "grey" literature. Considering the importance of discourse in humanistic research, and the process of production of knowledge as described above, it is no accident that electronic mail, discussion lists and workgroups, as well as interactive methods such as IRC and MOOs, have been hailed as important research tools. O' Donnell, comparing the virtual debate of an electronic discussion list with a physical graduate seminar, suggests that the quality of the former was higher than that of the latter and the discussion more focussed, because participants were truly interested and more knowledgeable in the issues debated. He reports a positive experience with using electronic communication as a complement to traditional methods. Apart from ten students registered on his normal course on Boethius' *Consolation of Philosophy*, more than two hundred subscribed to the discussion list, and, once a week, they got together in an interactive MOO discussion.[76]

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[72] Bates, 1996.
[73] Busch, 1997.
[74] Manoff, 1997.
[75] Indeed, the heavy use of references and citations in humanistic research (with footnotes accounting for more than 50% of published words in some disciplines) may be a significant factor why bibliographic services are not deemed as necessary as in the natural sciences (Wiberley and Jones, 1994).
[76] O' Donnell, 1995.

The combination of accessing electronic resources and human interaction begs the issue of shifting roles in the academic community. As noted with regard to George Landow's multi-media courses in Brown, "the course constitutes a society, while the students become citizens of a commonwealth".[77] This paradigm calls also for a radical shift in the role of librarians, who now become key actors in the knowledge process, and of the library as a place:

> … not a library that's a collection of independent monologues, but, rather, something that takes the library one stage forward – being the place where dialogue continues to take place, where the discussion is ongoing.[78]

Considerations for electronic communication and resource use

The discussion of the nature of humanistic research, of the impact of information technology on human science, of cultural information objects and resources (of which visual resources are an important part), and of different types of electronic communication, introduces the following considerations for the arts and humanities:

1. Supporting the humanistic research process

Developing an understanding of, and support for the humanistic research process, as a special kind a "business process", is recognised as a major prerequisite.[79] A broader examination of the methodology and practice of the humanities, along the lines discussed above, and of the function of information resources and scholarly communication, is needed. In particular, scholarly tasks corresponding with specific "modes" of research should be identified, and matched with a tool-set of systems and interface capabilities (e.g. annotation and attribution, comparison and presentation, synthesis), dealing, among other things, with visual resources (e.g. pattern matching).[80]

This should establish the truth or fallacy of common assumptions, such as the following, challenged by Dillon:

1. Associative linking of information models the workings of the mind;

2. Paper is a linear and therefore a constraining medium;

3. Rapid access to large mass of information leads to better use and learning;

4. Future technology will solve all problems.[81]

From the experiences discussed above, it is clear that, for electronic communication to achieve widespread use in the humanities, it will need to provide functions not possible by traditional means. Given that electronic communication tools, as well as publishing formats,

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[77] Lanham, 1993.
[78] O' Donnell, ibidem.
[79] Brodie, quoted in CSTB/NRC, 1998.
[80] Bearman, 1996.
[81] Dillon, 1996.

have been developed in response to problems in the sciences, it is necessary to explore and understand the *real* possibilities of the electronic media through empirical user-testing, based on the performance of specific tasks typical of humanistic research.

2. Developing adequate representation standards

As discussed above, the formal representation, firstly, of cultural information objects, such as artefacts and texts, and, secondly, of humanistic argument, is a particularly challenging task in the course of developing information resources and metadata for their effective discovery.[82] The development of commonly accepted standards and methods for adequate representation is necessary, in order to allow effective access in the distributed information universe made possible by inter-networking. Efforts to develop such standards should not be restricted to formatted data, but should also include heterogeneous – but nonetheless highly structured and complex – information objects, such as texts and images that constitute a vast resource of humanistic "legacy" data.

As summarised by Hockey, representation systems suitable for humanistic data should:

1. Be re-useable and multipurpose, for obvious economic reasons;

2. Be incremental, enabling new knowledge to be added;

3. Ensure information quality, so that they may support the use of information objects as evidence in the research process.

In addition, such systems should allow the expression of different *points of view* (corresponding to disciplines, scholarly traditions and user groups), concerning potentially inconsistent and densely connected knowledge structures. As argued above, emerging object-oriented and semantic information systems provide good alternatives to traditional databases for this purpose.

3. Building authority and trust

A *New Yorker* cartoon depicts a dog typing on its computer: "on the Internet nobody knows you're a dog". This, in fact, is an apt illustration of the problems of authority plaguing the credibility of "grey" humanistic information available on the World Wide Web. The proliferation of uncatalogued, heterogeneous WWW resources calls for the establishment of specific procedures (annotations, certification and inclusion criteria) to instill the notion of authority, such as is illustrated by the *Argos* limited area search engine mentioned above.

The same problem affects Internet communication, where the absence of status markers subverts the trust in the system.[83] Senior professors and first-year undergraduates in discussion lists are all reduced to email addresses; yet

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[82] Dallas, 1994; Hockey, 1996; Gardin, 1994.
[83] Garrett, 1996.

"[f]ew professors will sign on for discussion lists until the contributors are vetted in the same way that delegates to conferences and contributors to journals are - by cost, knowledge, or simply status".[84]

4. Building research communities

As noted by Gregorian, "[s]pecialisation, instead of uniting human beings into a general community of values and discourse, has by necessity divided them into small and exclusive coteries … creating [their] own small, self-confirming world of theory, technique, and methodology."[85] Electronic communication, facilitating collaborative work, may provide an opportunity for scholars to work together, overcoming the traditional solitary nature of humanistic research.[86] On the other hand, it may subvert the notion of academic *community*, built upon physical co-existence and peer group allegiance within a relatively stable academic structure; the danger of fragmentation of research communities is particularly important in the humanities, where knowledge is non-hierarchical, densely connected and contextual.

For these reasons, it is important to develop procedures and structures so that stable and broad virtual communities are developed, ensuring that the production of knowledge does not become excessively fragmented and that continuity is preserved. This requires an evolutionary approach, expanding on the functions of existing learned societies, print journals and traditional conferences, and building new community mechanisms, such as humanities information technology support services, specialist conferences and publications.[87]

5. Ensuring professional recognition

The underlying motives of academic research and publication, as identified explicitly by Richards are a) self-aggrandizement and career promotion, b) to seek to influence (i.e. research, education, propaganda, entertainment), c) to seek to record (i.e. data dissemination).[88] Work on building electronic resources (including editorial services, indexes, meta-indexes, information evaluation and certification services) is not rewarded in the humanities so far as tenure and professional recognition is concerned; this acts as a counter-incentive for humanists' involvement in developing information resources and using electronic communication tools.[89]

To counteract this tendency, criteria should be developed for the academic evaluation of work involving the development of electronic resources, such as datasets, and communication

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[84] Richards, 1994.
[85] Gregorian, 1993.
[86] Arms, 1993; Grabar, 1993.
[87] Pavliscak *et al.,* 1997.
[88] Richards, ibidem.
[89] CSTB/NRC, 1998. To illustrate the point, Arms (1993) tells the story of Gregory Crane, editor-in-chief of the *Perseus* digital resource, who had to move from Harvard University, because his work on *Perseus,* involving the organisation of a complex web of scholarly resources, was not academically recognised.

tools; on a broader scale, an effort to encourage institutions to include electronic work as a criterion for professional advancement, shifting current priorities, would be helpful.

6. Preserving alternative knowledge

It is generally accepted that preservation of the primary sources of the intellectual and cultural record of humanity, as well as the scholarly knowledge built upon the study of that record, is going to be drastically redefined by information technology; procedures and criteria involved in its definition (including the definition of priorities for preservation) are going to be affected accordingly. As new intellectual preservation projects and digital retro-conversion projects are defined, it is important that predominant concerns of the day within specific humanistic disciplines are not allowed to influence unduly the preservation procedures and criteria, discriminating against alternative cultures, languages, texts, monuments, or scholarly views and priorities.

7. Safeguarding equal access

On the other hand, information technology is going to have a major effect on the ease, or even the possibility, of accessing the intellectual and cultural heritage, by different sectors of the academic community or by society at large. Considering the public mission of humanistic research, discussed above, it is important that the transition towards a model of scholarship that depends increasingly on access to electronic infrastructure and resources be marked by a "new intellectual ethic",[90] ensuring equity of access to scholars, students and citizens from different parts of the globe.

8. Establishing a new canon

In the Gutenberg era, the "canon" of specific disciplines was formed by the set of canonical works (texts, art objects, etc.) that were considered classical, and essential for humanistic knowledge. The canon is for the humanities what scientific laws and laboratory practices are for natural science; in fact, arts and humanities education depends on the conception of a canonical, standard set of "key" works, which can be found in almost every academic library or slide collection, and are prescribed in most curricula for teaching, study and examination.

One of the most significant results of information technology concerns the availability of electronic resources in specific humanistic disciplines, and its effect on canon reform. This effect is already visible in some interdisciplinary or alternative domains, such as women's studies.[91] However, except possibly for Classical Greek studies (where the impact of *Perseus* cannot be underestimated), electronic resources have failed so far to penetrate the curriculum of more traditional humanistic disciplines.

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[90] Grabar, 1993.
[91] An example is Elisabeth Fay's *Bluestocking Archive*, achieving the inclusion of women and under-represented authors in Romanticism via electronic indexes, without the limitations of anthologies (Manoff, 1997)..

The definition of canonical collections, corresponding to a core curriculum in the humanities, becomes important in the context of developing accession policies for electronic materials by libraries and academic institutions, and cannot be replaced by the accidental set of key works that may belong to a given special collection. A starting point, in the case of visual resources, is teaching slide collections, which already represent a sort of canon;[92] their digitisation and cataloguing should be pursued independently of large-scale preservation projects. Subject librarians and educational resource specifiers – typically teachers and scholars – have a key role in specifying the nature and contents of electronic canonical collections, which, by the sheer availability and ease of use, will be a predominant factor for curriculum reform.

9. Exploring new kinds of rights

The concept of authorship is contested by electronic communication and publication, by the ease of amendment of electronic texts, and by the blurring of the distinction between reference and citation within hypermedia resources. These phenomena raise important intellectual property right questions, which need to be explored further:

> In a networked, digital world, works will be created, revised and expanded; new media will be incorporated; links to external resources will be generated; the resulting work may not share a single sentence or image with the original one, despite a clear chain of provenance. Whose work is it? Legally? Intellectually? Morally?[93]

Besides, with the development of large-scale image bases, it is likely that digital images will be increasingly used in research as surrogates for artworks, archival sources, etc. Standards for digitisation of such cultural objects have to be agreed, so that digital images may be admissible as evidence in research, and the notion of authenticity and faithfulness of representation needs to be re-examined in this context.[94]

10. Investing in information content

Finally, funding the development of electronic information content becomes a key priority for humanistic research. Since experience in the past has shown that the arts and humanities are marginalised when included in funding initiatives along with the natural sciences, it makes sense to promote the development of an independent programme of electronic resource creation and retro-conversion for the humanistic disciplines. As a recent report on arts and humanities computing in the United States has concluded, the next steps should include:

1. Sponsoring a long-term project to co-ordinate digital library initiatives in the United States with those of foreign libraries and nations, and

2. Encouraging greater awareness of the importance of humanities computing, and more

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[92] Lynch, 1997.
[93] Garrett, 1996.
[94] Trant, 1997.

integration of humanities applications in future Digital Library Initiative competitions.[95]

Europe should not lag behind the United States in this area; in particular, European Union member-states should develop co-operative initiatives for resource creation and retro-conversion, within the framework of existing or planned research, culture, and information society policies and programmes of the European Commission. In addition, requirements stemming from humanistic research can be useful in opening up new, challenging research agendas for information technology and telematics applications and services.

Conclusion

The methods and practices of the humanities distinguish them from the natural sciences and technological disciplines, on the needs of which current electronic information and communication tools have been modelled. Cultural information objects, on which humanistic research depends heavily, present a number of characteristics and problems related to deeper methodological issues and research practices. The experience of using information resources and methods of electronic communication in the arts and humanities also presents important differences from the sciences.

The ten issues identified above bear on the effective development and use of electronic resources and on electronic communication in humanistic research. They demonstrate the interdependence between method and practice in the humanities with the traits of cultural information objects, their use as resources, and the methods of electronic communication. They support the need for further empirical research on the specific information requirements of the humanities, and for the allocation of significant resources to meet these requirements, as a precondition for a successful transition to the information age.

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[95] CSTB/NRC, 1998.

Relevant projects and web sites

a.k.a. http://www.ahip.getty.edu/aka/ (April 1998).

American Memory: Historical Collections for the National Digital Library. http://lcweb2.loc.gov (April 1998).

ARGOS: Limited Area Search of the Ancient and Medieval Internet. http://argos.evansville.edu/ (April 1998).

Arts and Humanities Data Service. http://ahds.ac.uk (April 1998).

ArtServe. http://rubens.anu.edu.au (April 1998).

Beazley Archive. http://www.ashmol.ox.ac.uk/castgal/ba.html (April 1998).

Bluestocking Archive http://fay.english.umb.edu/archive/toc.html

British National Corpus. http://info.ox.ac.uk/bnc/ (April 1998).

Bryn Mawr Classical Review. http://ccat.sas.upenn.edu/jod/bmr.html (April 1998).

Center for Electronic Texts in the Humanities. http://www.ceth.rutgers.edu/ (April 1998).

CIDOC, the International Documentation Committee of the International Council of Museums. http://www.cidoc.icom.org/ (April 1998).

Collaboratory for the Humanities. http://www.hti.umich.edu/collaboratory/ (April 1998).

The Complete Writings and Pictures of Dante Gabriel Rossetti: A Hypermedia Research Archive. http://jefferson.village.virginia.edu/rossetti/rossetti.html (April 1998).

Getty Information Institute. http://www.gii.getty.edu/ (April 1998).

HUMANIST. http://www.princeton.edu/~mccarty/humanist/ (April 1998).

Institute for Scientific Information. http://www.isinet.com/ (April 1998).

Internet Archaeology. http://intarch.ac.uk/ (April 1998).

Institute for Advanced Technology in the Humanities. http://jefferson.village.virginia.edu/ (April 1998).

Labyrinth. http://www.georgetown.edu/labyrinth/labyrinth-home.html (April 1998).

Model Editions Partnership. http://mep.cla.sc.edu/ (April 1998).

Museum Educational Site Licensing Project. http://www.ahip.getty.edu/mesl/home.html (April 1998).

National Initiative for a Networked Cultural Heritage (NINCH). http://www-ninch.cni.org/ (April 1998).

Oxford Text Archive. http://sable.ox.ac.uk/ota/ (April 1998).

Perseus. http://www.perseus.tufts.edu/ (April 1998).

Text Encoding Initiative. http://www.uic.edu/orgs/tei/info/teij31/ (April 1998).

Thesaurus Linguae Graecae. http://www.uci.edu/~tlg/ (April 1998).

University of Michigan Papyrus Collection. http://www.lib.umich.edu/pap/HomePage.html (April 1998).

Virtual Library Museums Page. http://www.icom.org/vlmp/ (April 1998).

Voice of the Shuttle. http://humanitas.ucsb.edu/ (April 1998).

WebMuseum, Paris. http://sunsite.unc.edu/wm/ (April 1998).

References

Arms, W.Y. (1993) The institutional implications of electronic information. In: Katz, S.N. and Ester, M., eds. (1993) *Technology, Scholarship and the Humanities: The Implications of Electronic Information.* http://www.cni.org/docs/tsh/Arms.html (April 1998).

Arnold, K. (1992) The scholarly monograph is dead: long live the scholarly monograph! Association of Research Libraries (1992) *Scholarly Publishing on the Electronic Networks.* Proceedings of the Second Symposium, December 5-8, 1992 http://arl.cni.org/scomm/symp2/ Arnold.html (April 1998).

Bates, M.J. (1996) The Getty end-user online searching project in the humanities. Report no. 6: Overview and conclusions. *College and Research Libraries,* 57 (1996), 514-523.

Bearman, D. (1996) Overview and discussion points. In: Getty Art History Information Program (1996) *Research Agenda for Networked Cultural Heritage.* Santa Monica, CA: Getty AHIP, 7-22.

Besser, H. (1996) The transformation of the museum. In: Jones-Garmil, K. (1996) *Museums and Emerging Technologies.* Washington: American Association of Museums. http://www.sims.berkeley.edu/~howard/Papers/garmil-transform.html (April 1998).

Bhaskar, R. (1979) *The possibility of naturalism.* Brighton: Harvester Press.

Burnard, L. and Short, H. (1994) *An Arts and Humanities Data Service.* Report of a feasibility study commissioned by the Information Services Sub-committee of the Joint Information Systems Committee of the Higher Education Funding Councils. Oxford: JISC.

Busch, J. (1997) Evolving institutional approaches to subsidizing end user access to research databases: a case study. *Archives and Museum Informatics,* 11, 39-46.

Butterworth, I., ed. (1998) *The Impact of Electronic Publishing on the Academic Community.* Wenner-Gren International Series, vol. 93. London: Portland Press.

CSTB/NRC (Computer Science and Telecommunications Board, National Research Council) (1998) *Computing and the Humanities: Summary of a Roundtable Meeting.* ACLS Occasional Paper No. 41. http://www.acls.org/op41-toc.htm (April 1998).

Crane, G. (1996) New technologies for reading: the lexicon and the digital library. http://www.perseus/tufts/edu/~gcrane/lsj.cw.html (April 1998).

Crane, G. (1998) The Perseus project and beyond: how building a digital library challenges the humanities and technology. *D-Lib,* January 1998. http://www.dlib.org/dlib/ january98/01crane.html (April 1998).

Dallas, C. (1992a) Syntax and semantics of figurative art: a formal approach". In: Reilly, P. and Rahtz, S.P.Q. (1992) *Archaeology and the Information Age: a global perspective.* One

World Archaeology. London: Routledge, 230-275.

Dallas, C. (1992b) Information systems and cultural knowledge: the Benaki Museum case. *Computers and the History of Art Journal,* 3, 7-15.

Dallas, C. (1994) A new agenda for museum information systems. Pre-circulated papers, *Problems and Potentials of Electronic Information in Archaeology* Seminar (1994), British Library, London. To be published.

Dallas, C. (1997) A step beyond reading in archaeological publication: Internet Archaeology, issue 1. *Archives and Museum Informatics*, vol. 11. http://www.csd.uch.gr/~dallas/intarch.htm (April 1998).

Dillon, A. (1996) Myths, misconceptions and an alternative perspective on information usage and the electronic medium. In: Rouet, J.-F., Levonen, J.J., Dillon, A.P. and Spiro, R.J. eds. (1996) *Hypertext and Cognition.* Hillsdale, NJ: Lawrence Erlbaum Associates. http://www.slis.indiana.edu/adillon/adillon-myths.html (April 1998).

Feeney, M. and Ross, S. (1993) *Information Technology in Humanities Scholarship: British Achievements, Prospects, and Barriers.* British Library R&D Report 6097. London: The British Library and The British Academy.

Gardin, J.-C. (1980) *Archaeological Constructs : an Aspect of Theoretical Archaeology,* Cambridge; New York: Cambridge University Press.

Gardin, J.-C. (1994) The consequences, good or bad, of taking knowledge bases seriously. Pre-circulated papers, *Problems and Potentials of Electronic Information in Archaeology* Seminar (1994), British Library, London.

Garrett, J. (1996) New social and economic mechanisms to encourage access. In: Getty Art History Information Program (1996) *Research Agenda for Networked Cultural Heritage.* Santa Monica, CA: Getty AHIP, 69-74.

Gerrard, R. (1998) With all this I.T., are we doing our job better? Paper submitted to the 1998 *Museums and the Web Conference.* http://www.archimuse.com/mw98/papers/gerrard/gerrard_paper.html (April 1998).

Getty Art History Information Program (1996) *Research Agenda for Networked Cultural Heritage.* Santa Monica, CA: Getty AHIP.

Gibbon, G. (1989) *Explanation in Archaeology.* Oxford: Basil Blackwell.

Ginsparg, P. (1994) First steps towards electronic research communication. *Computers in Physics,* 8 (4), 390-396. http://xxx.lanl.gov/blurb/ (April 1998).

Grabar, O. (1993) The intellectual implications of electronic information. In: Katz, S.N. and Ester, M., eds. (1993) *Technology, Scholarship and the Humanities: The Implications of Electronic Information.* http://www.cni.org/docs/tsh/Grabar.html (April 1998).

Green, D. (1997) The National Initiative for a Networked Cultural Heritage (NINCH). In: *Internet-Accessible Scholarly Resources for the Humanities and Social Sciences, ACLS Newsletter,* vol. 4, no. 4 (February 1997). http://www.acls.org/n44green.htm (April 1998).

Gregorian, V. (1993) Keynote address. In: Katz, S.N. and Ester, M., eds. (1993) *Technology, Scholarship and the Humanities: The Implications of Electronic Information.* http://www.cni.org/docs/tsh/Keynote.html (April 1998).

Harrison, T. M., Stephen, T. and Winter, J. (1991) Online journals: disciplinary designs for electronic scholarship. *The Public-Access Computer Systems Review* 2, no. 1 (1991), 25-38. http://info.lib.uh.edu/pr/v2/n1/harrison.2n1 (April 1998).

Harter, S. P. (1996) The impact of electronic journals on scholarly communication: a citation analysis. *The Public-Access Computer Systems Review*, 7, no. 5 (1991). http://info.lib.uh.edu/pr/v7/n5/hart7n5.html (April 1998).

Hemmings, T., Randall, D., Francis, D., Marr, L., Divall, C. and Porter, G. (1997) Situated knowledge and the virtual science and industry museum: problems in the social-technical interface. *Archives and Museum Informatics,* 11, 147-164.

Hockey, S. (1996) Knowledge representation. In: Getty Art History Information Program (1996) *Research Agenda for Networked Cultural Heritage.* Santa Monica, CA: Getty AHIP, 31-34.

Hockey, S. (1997) Electronic Texts: The Promise and the Reality. In: *Internet-Accessible Scholarly Resources for the Humanities and Social Sciences, ACLS Newsletter,* vol. 4, no. 4 (February 1997). http://www.acls.org/n44hock.htm (April 1998).

Hoopes, J.W. (1997) The future of the past: archaeology and anthropology on the World Wide Web. *Archives and Museum Informatics,* 11, 87-105.

Katz, S.N. and Ester. M., eds. (1993) *Technology, Scholarship and the Humanities: The Implications of Electronic Information.* http://www.cni.org/docs/tsh/Arms.html (April 1998).

Kenny, A. (1992) *Computers and the Humanities.* The Ninth British Library Research Lecture, 1991. London: The British Library.

Kolker, R. and Schneiderman, B. (1996) Tools for creating and exploiting content. In: Getty Art History Information Program (1996) *Research Agenda for Networked Cultural Heritage,* Santa Monica. CA: Getty AHIP, 27-30.

Langston, L. (1996) Scholarly Communication and Electronic Publication: Implications for Research, Advancement, and Promotion. http://www.library.ucsb.edu/untangle/langston.html (April 1998).

Lanham, R.A. (1993) The implications of electronic information for the sociology of knowl-

edge. In: Katz, S.N. and Ester, M., eds. (1993) *Technology, Scholarship and the Humanities: The Implications of Electronic Information.* http://www.cni.org/docs/tsh/Lanham.html (April 1998).

Lynch, C.A. (1997) The uncertain future for digital visual collections in the university. *Archives and Museum Informatics,* 11, 5-13.

Manoff, M. (1997) Cyberhope or cyberhype? Computers and scholarly research. http://libraries.mit.edu/humanities/manoff.html (April 1998).

Marchionini, G. (1996) Resource search and discovery. In: Getty Art History Information Program (1996) *Research Agenda for Networked Cultural Heritage.* Santa Monica, CA: Getty AHIP, 35-40.

McCarty, W. (1997) Because It's Time: A Commentary on the Program Session. In: *Internet-Accessible Scholarly Resources for the Humanities and Social Sciences, ACLS Newsletter,* vol. 4, no. 4 (February 1997). http://www.acls.org/n44mccar.htm (April 1998).

Mullings, Ch. (1992) *Computers and Communication in the Humanities: A Survey of Use.* Publication No 1. Oxford: Office for Humanities Communication.

O'Donnell, J.J. (1994) Going electronic: the *Bryn Mawr Classical Review. Surfaces,* vol. 4. http://elias.ens.fr/Surfaces/vol4/o'donnel.html (April 1998).

O'Donnell, J.J. (1995) Humanities in the 21st century. Interviewed by NEH Chairman Sheldon Hackney. *Humanities,* September-October 1995. http://ccat.sas.upenn.edu/jod/hackney.html (April 1998).

Okerson, A. (1994) Oh Lord, Won't You Buy Me A Mercedes Benz, Or, There is a There There. *Surfaces,* vol. 4. http://www.library.yale.edu/~okerson/surfaces.html (April 1998).

Pavliscak, P., Ross, S. and Henry, Ch. (1997) *Information Technology in Humanities Scholarship: Achievements, Prospects, and Challenges - The United States Focus.* Occasional paper No. 37. American Council of Learned Societies. http://www.acls.org/op37.htm (April 1998).

Perseus Project (1996) *Perseus FIPSE Evaluation Final Report.* http://www.perseus.tufts.edu/FIPSE/report_final.html (April 1998).

Richards, J.D. (1994) Disseminating the data: archaeological publication in the electronic age. Pre-circulated papers, *Problems and Potentials of Electronic Information in Archaeology* Seminar (1994), British Library, London.

Romer, D.M. (1996) Image and multimedia retrieval. In: Getty Art History Information Program (1996) *Research Agenda for Networked Cultural Heritage.* Santa Monica, CA: Getty AHIP, 49-56.

Trant, J. (1997) Images on the Internet: issues and opportunities. In: *Internet-Accessible*

Scholarly Resources for the Humanities and Social Sciences, ACLS Newsletter, vol. 4, no. 4 (February 1997). http://www.acls.org/n44trant.htm (April 1998).

Valauskas, E.J. (1997) Waiting for Thomas Kuhn: *First Monday* and the evolution of electronic journals. J*ournal of Electronic Publishing*, September 1997, volume 3, issue 1. http://www.press.umich.edu/jep/03-01/FirstMonday.html (April 1998).

Vince, A., with Richards, J., Ross, S. and Heyworth, M. (1997) Publishing archaeology on the Web: who reads this stuff anyway? *Internet Archaeology,* 3. http://intarch.ac.uk/journal/issue3/vince/caa97.html (April 1998).

Walsh, P. (1997) The web and the unassailable voice. *Archives and Museum Informatics,* 11, 77-85.

Wiberley, S.E. Jr and Jones, W.G. (1994) Humanists revisited: a longitudinal look at the adoption of information technology. *College and Research Libraries,* 55 (1994), 499-509.