

Key Ideas and Concepts of Digital Humanities

Institut für Sprach- und Literaturwissenschaft
Team DHDarmstadt

URL: <http://www.dh-concepts.tu-darmstadt.de>

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Wednesday, 28 October 2015



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1. Table of contents

1.	Table of contents	i
2.	Key ideas and concepts of Digital Humanities	1
2.1.	Organisation	2
2.2.	List of speakers	2
3.	Titles and abstracts	3
3.1.	Elisabeth Burr	3
3.2.	Julia Flanders	3
3.3.	Hans Walter Gabler	3
3.4.	Kurt Gärtner	4
3.5.	Susan Hockey	4
3.6.	Claus Huitfeld	5
3.7.	Nancy Ide	5
3.8.	Fotis Jannidis	6
3.9.	George Landow	7
3.10.	Wilhelm Ott	7
3.11.	Marco Passarotti	8
3.12.	Peter Robinson	8
3.13.	Geoffrey Rockwell	9
3.14.	Michael Sperberg-McQueen	9
3.15.	Manfred Thaller	10
3.16.	Joachim Veit	11
4.	Key ideas and concepts of DH: programme (24.10.2015)	12

2. Key ideas and concepts of Digital Humanities

The conference "Key ideas and concepts of Digital Humanities" which is supported by the Deutsche Forschungsgemeinschaft (DFG) is going to be hosted at Technische Universität Darmstadt from 26 to 28 October 2015. All colleagues and students interested in the Digital Humanities are invited; participation is of free of charge. The conference registration is open now at:

<http://www.dh-concepts.tu-darmstadt.de>

The hosts are Michael Sperberg-McQueen, who holds the KIVA International Visiting Professorship for Interculturality and Andrea Rapp, Professor for Computer Philology at Technische Universität Darmstadt as well as Sabine Bartsch and Michael Bender, all members of the working group DHDarmstadt.

Conference theme

The role of the Digital Humanities is currently discussed controversially with a view of both the present and the future. It seems a truism that we need to incorporate the past, if we are to conduct a fruitful discussion of the future. The basis for the present and future role of the field are the key ideas and concepts from which it has evolved. A reappraisal of the history of ideas not only shows the essence of the field, but also highlights the potential it has to offer for the humanities and other, related fields. The interaction of computational concepts with ideas from the breadth of humanities-disciplines has the potential to generate more than the sum of the parts. Since the inception of the field formerly known as humanities computing, new methods were developed and new insights gained. Frequently, interdisciplinary border crossings constitute key moments in which new ideas and concepts emerge. The compilation of a history of ideas of the Digital Humanities is possible, and it is necessary. With this conference, we aim to chart the history of the digital humanities by focusing on a discussion of the key ideas and concepts and the associated key-moments in the development of the field.

Whether early pioneering achievements such as the cooperation between Father Roberto Busa and IBM since the late 1940s; Vannevar Bush's essay "As We May Think" describing the landmark idea and design for the Memex; younger milestones such as the establishment of the Text Encoding Initiative (TEI), or the conception of the eXtensible Markup Language (XML) – examples of key ideas of the DH abound.

The event is centred around experts from different areas of the Digital Humanities, each presenting a paper on a key idea or a moment in their research area. The conference will help to identify the most important achievements of the field and discuss their origins and position, their impact and development or possibilities for development.

2.1. Organisation

Conference dates:	Monday, 26 October - Wednesday, 28 October 2015
Organisers:	Sabine Bartsch and Michael Bender, Team DHDarmstadt Technische Universität Darmstadt Institut für Sprach- und Literaturwissenschaft
Contact:	dh-concepts@linglit.tu-darmstadt.de
Conference URL:	http://www.dh-concepts.tu-darmstadt.de

2.2. List of speakers

- Elisabeth Burr | Professorin für Französische / frankophone und italienische Sprachwissenschaft an der Universität Leipzig
- Julia Flanders | Professor of the Practice in English, College of Social Sciences and Humanities, Northeastern University and Director of the Digital Scholarship Group, Northeastern University Library
- Hans Walter Gabler | Professor (emeritus) für Englische Philologie und Editionswissenschaft, LMU München
- Kurt Gärtner | Professor (emeritus) für Ältere deutsche Philologie (Sprachgeschichte), Universität Trier
- Susan Hockey | Professor (emeritus) of Library and Information Studies and Director of the School of Library, Archive, and Information Studies at University College London and founding member and chair of the Association for Literary and Linguistic Computing (1984–97)
- Claus Huitfeldt | Associate Professor at the Department of Philosophy of the University of Bergen
- Nancy Ide | Professor at the Department of Computer Science, Vassar College, founding member and President of the Association for Computers and the Humanities (1985-1995) and co-editor of the journal Computers and the Humanities (1995-2004)
- Fotis Jannidis | Professor für Computerphilologie und Neuere Deutsche Literaturgeschichte, Universität Würzburg
- George Landow | Professor of English and Art History, Brown University
- Wilhelm Ott | Universität Tübingen and Pagina Publikationstechnologien
- Marco Passarotti | Computational Linguist, Index Thomisticus, Università Cattolica del Sacro Cuore di Milano, Italy
- Peter Robinson | Professor for Digital Methods in the Humanities, University of Saskatchewan
- Geoffrey Rockwell | Professor of Philosophy and Humanities Computing, University of Alberta
- C. Michael Sperberg-McQueen | Black Mesa Tech Inc.
- Manfred Thaller | Professor (emeritus) für Historisch-Kulturwissenschaftliche Informationsverarbeitung, Universität zu Köln
- Joachim Veit | Professor der Universität Paderborn und Editionsleiter der Carl-Maria-von-Weber-Gesamtausgabe

3. Titles and abstracts

3.1. Elisabeth Burr

Professorin für Französische / frankophone und italienische Sprachwissenschaft, Universität Leipzig

Digital Humanities - The long way to teaching and learning a new epistemology. Some reflections

3.2. Julia Flanders

Professor of the Practice in English, College of Social Sciences and Humanities, Northeastern University and Director of the Digital Scholarship Group, Northeastern University Library

Looking for Gender in the History of Digital Humanities

Gender has been central to the history of digital humanities. But it has operated as a “core concept” in that history through many different structural roles. Practitioners and theorists in humanities computing and digital humanities have wrestled with the role gender plays in the structure of professional organizations and workplaces, in our research agendas and the content of our research collections, in our habits of discourse and our data models, in the architecture of our technical systems and in the politics of their development. How has this history shaped our current field, and how can it inform our ideas about the future of digital humanities? What needs to be changed and where do we look for sources of change?

3.3. Hans Walter Gabler

Professor (emeritus) für Englische Philologie und Editionswissenschaft, LMU München

Digital Challenges to Scholarly Editing

While the book remains and will remain with us in which to read the texts of our cultural heritage, the native ground for the scholarly edition is, and will increasingly become, the digital medium: for the digital medium is where the scholarly edition is now, and will yet more comprehensively be, established, circulated, and used. This premise harbours a complex set of challenges. To edit works and their texts in the digital medium differs in manifold ways from the traditional enterprise of scholarly editing in (private) recluses that culminated, and for many practical purposes ended, in printed books. The scholarly edition of the future as digital edition is to be conceived of, rather, as processually dynamic, relational, and interactive: to open it on and as a web platform is not a making-public of an end product of (pre-public) editorial labour; it is the public beginning of its life as a cross-roads of recording, image documentation and diachronic stratification, of texts, of knowledge retrieval and cumulation (vulgo: commentary), and of ongoing, individual as well as communal, research. It is on this spectrum of considerations that I wish to remark, if selectively, in my paper.

3.4. Kurt Gärtner

Professor (emeritus) für Ältere deutsche Philologie (Sprachgeschichte), Universität Trier

Editions, printed and digital: towards an open critical edition

Looking back at the history of textual criticism I choose three examples, two from my own field, firstly the ‘Arme Heinrich’ by Hartmann von Aue, secondly the ‘Parzival’ by Wolfram von Eschenbach, both works belonging to the classical German literature around 1200, and thirdly the New Testament. All three examples are strongly connected with the establishment of critical editions, and with the founder fathers of Germanistik, the brothers Grimm and Karl Lachmann.

I will follow more extensively the history of editing the ‘Arme Heinrich’, beginning with the first critical edition by the brothers Grimm and ending with my own edition and the new ways it has been created in the digital age, and how the transmission has been made available. Much shorter is the history of editing the ‘Parzival’, because the first critical edition by Karl Lachmann, published in 1833, has never been replaced up to now. However, a new critical edition is on its way, making use of every support DH is offering.

A short look at present days New Testament studies should demonstrate how the transmission of the text could be made available today and used for establishing a critical text, opening up new horizons for all interested in editing the New Testament, although a critical edition should appear in print as a long term reliable source for references. This represents the perfection of a model which the editors of the ‘Arme Heinrich’ and the ‘Parzival’ are striving to follow, although the connection of their critical text to the transmission might vary.

3.5. Susan Hockey

Professor (emeritus) of Library and Information Studies and Director of the School of Library, Archive, and Information Studies at University College London and founding member and chair of the Association for Literary and Linguistic Computing (1984–97)

Perspectives on some key developments in text-based applications

During my career, I have been involved in a variety of projects and I have worked in a research laboratory, an academic computing service, a library and two different academic departments, all in different institutions. My interests have mostly concentrated on the creation, manipulation and delivery of text-based humanities resources. In this talk I will attempt to show how key issues in some areas have led to new developments in other areas. I will look at some of the challenges facing early users and consider which of these have been to a large extent resolved by developments in technology and which still raise serious intellectual questions.

In broad terms I would characterize the history of digital humanities as a combination of intellectual curiosity and the development and use of tools, resources and knowhow to meet the needs of humanities researchers, of funding bodies and, more recently, of libraries. Given the cost of creating and managing resources, how to coalesce these needs into some common reusable applications has presented serious intellectual issues, which are still apparent as more and more information is only in digital format.

Moreover, in some ways, work in digital humanities has been ahead of its time, making it more difficult for other researchers, and funders, to understand why it is needed.

For a long time practitioners in humanities computing formed a fairly small community, which met at regular conferences, where most of the papers were about individual research projects. Intellectual challenges excited this audience, but they also found that they had to take on wide-ranging organizational issues and, with the advent of the Internet, projects like the TEI which crossed international and cultural boundaries.

The advent of the World Wide Web in the early 1990s enabled almost anyone to be a publisher. It brought in many more potential users and it made it much easier for people to promote and publicize their work. With so much information, but no gatekeeper, on the Web, it became more difficult for new users to build on existing knowhow in the humanities computing community. It was easier to re-invent the wheel. Teaching the next generation became more important, but there were questions in deciding what to teach and what qualifications might be appropriate. Libraries also now play an important role in the delivery of electronic resources but they, too, have had to adapt to new kinds of user needs and new requirements for metadata.

3.6. Claus Huitfeld

Professor at the Department of Philosophy of the University of Bergen

Philology and text technology

3.7. Nancy Ide

Professor at the Department of Computer Science, Vassar College, founding member and President of the Association for Computers and the Humanities (1985-1995) and co-editor of the journal *Computers and the Humanities* (1995-2004)

The TEI legacy: where we have gone from there

Undoubtedly one of the greatest {if not the greatest| contribution of the field of humanities computing is the founding of the Text Encoding Initiative. When it was established in 1987, the TEI was overseen by three professional associations, including one devoted exclusively to the field of computational linguistics. Since then, the TEI has profoundly influenced not only humanities scholarship but also standards for representing language data in electronic form in general, and it also laid the groundwork for twenty subsequent years of effort to devise standards for representing data intended for use in the field of computational linguistics, within efforts such as the XML Corpus Encoding Standard (XCES) and, more recently, work within ISO TC37 SC4. These efforts were undertaken largely independently of the TEI and humanities computing in general; however, there has been recent interest in attempting to harmonize the TEI Guidelines and standards developed by groups such as ISO TC37 SC4, thus coming full circle to rejoin efforts within the two fields. This presentation will trace this history of standards

development from the inception of the TEI through the present day, with special attention to the intellectual context that drove it, and consider more broadly the past, present, and potential relationship between the fields of computational linguistics and digital humanities.

3.8. Fotis Jannidis

Professor für Computerphilologie und Neuere Deutsche Literaturgeschichte, Universität Würzburg

Using large text collections for text analysis

It is well-known, that at some point a change in quantity will become a change in quality too. In the beginning, quantitative text analysis could be viewed as a form of reading support, using basically the same texts a human reader would use, offering insights into, for example, the distributions of interesting phrases or cooccurrences, allowing the human researcher to zoom in into interesting passages of the text under scrutiny. This view was already a challenge for many traditional scholars, but it shared many basic assumptions with them: The important part of the analysis was done by a human reader. The key concept I am interested in is the shift to the use of very large text collections for textual analysis which in the beginning only looks like a more (much more) of the same, but it really changes the rules. It shifts the focal point of the activity of the researcher from perusing lists to setting up complex pipelines of natural language processing tools and doing statistical analysis of the outcomes. The competences needed to do this kind of research differ dramatically from those of the older research setups. And there is another change: Because at the moment we do not have enough texts of scholarly quality in any language to do this kind of large text collections, a main tenet of philological work is suspended, even if it is understood to be only temporarily. The development of this approach to textual analysis was supported by concepts and needs which had arisen in textual studies without any link to the digital. The critique of the canon in literary studies with its implied call to reassess literary history and to have an open eye for popular genres, the rise of cultural history in many disciplines in the Humanities and an interest in everyday culture, all this marks an interest for the non-elite, for the masses, and creates a demand for tools which are able to handle the large amounts of texts used in this kind of research. The concept of "distant reading" (Moretti) was, before it went digital, a way of looking at large-scale historical developments by using metadata on the texts and by compiling information laid down in scholarly articles instead of reading everything yourself and. The metaphor "distant reading" has been challenged by some, who proposed "macroanalysis" (Jockers), thus emphasizing the analytical part, or scalable reading (Mueller), emphasizing the connection to the reading of text. I will try to cover some of the more prominent steps in the complex history of this concept, but will have to concentrate on the English and German research literature though it is obvious that the negotiations around this concept can differ quite a lot, depending on the self-conception of the Humanities and other factors in the national and international research community.

3.9. George Landow

Professor of English and Art History, Brown University

It's all Google's fault!

As I argued in my talk last November at Google London: it's all Google's fault: In the 90's the battle between those who favored link-based hypermedia and search tools ended with a victory for the link when the WWW came along. But when Google successfully created a superb search tool, that became the victor with the effect that, as we have seen with surveys of university students, readers tend to use search tools rather than follow links even when links lead directly to the material for which they are searching. We assume that readers who live on their iPhones and Galaxies are computer literate, and in certain ways they certainly are, but they have lost or never had the ability to read and think hyper textually. We have found, however, that a brief 5-minute explanation of how the Victorian Web was constructed and the advantages of think of networked information results in readers reading hyper textually. In the last part of my talk I would like to discuss how these issues have led to experiments with sitemaps / homepage for complex subject areas in the Victorian Web, such as religion, political history, and painting, which all have numerous sub-categories.

3.10. Wilhelm Ott

Universität Tübingen and Pagina Publikationstechnologien

Designing humanities computing tools:

insights from a 49-years trip from assembler programming to an XML-based toolbox

"The conventional approach to design of computing tools for the humanities is", as Willard McCarty says in "Humanities Computing" (Palgrave Macmillan 2014, p. 217), "exemplified by the Tübingen System of Text Processing Programs": it "demonstrates a cogent and practical design, which in turn raises questions we need to be asking: Are these the right sort of primitives? Are they at the right level of abstraction?"

Questions asked in and the contents examined by "digital humanities" or "e-humanities" have of course shifted since 1966 when I started computing in the humanities and when I had been employed by the Computing Center of the University of Tübingen to continue my own research and to care for computer support for other humanities projects.

Nevertheless, also today "close reading" questions and the respective tools play an essential role in the text based humanities. It may therefore be useful to have a closer look at some key insights we have gained from giving technical advice and support to projects from the whole spectrum of text-based humanities research, and which we always regarded as important for designing a toolbox for scholarly text data processing.

One of the key features of this toolbox which Kuno Schälkle and myself developed from 1970 is its consistent modularity: it is made up of a set of programs, each covering and concentrating on a relatively elementary function of text data handling required in the different phases of a text based project, from data entry over data analysis, data manipulation, up to the publication in print or on electronic media or the web. Each of these programs takes a text data file as its input and writes the output to a new text

data file. Parameters may be used to define the details of processing. The single modules can be combined in almost arbitrary ways in order to provide a solution for each single step to be performed, also for problems not foreseen by the developer, and for establishing a workflow for the whole project.

The paper will give a short account how we very early arrived at this concept, and it will give a short example of its implementation and application in TXSTEP, the XML-based user interface to this proven toolbox.

3.11. Marco Passarotti

CIRCSE Research Centre, Università Cattolica del Sacro Cuore, Milan, Italy

Great Expectations Seeding Forests of Trees.

Some key ideas of Digital Humanities in Father Busa's own words

In my talk, I will present some key ideas of computational linguistics and digital humanities taken from two papers of one of the pioneers in the field, father Roberto Busa SJ.

In the two papers (from 1962 and 1983, respectively), father Busa discussed the impact of "automation" on the Humanities and presented a number of open challenges that he thought the discipline would have had to face in the coming years.

I will show that many of the great expectations mentioned by Busa have now become reality. In particular, I will present the current state of the Index Thomisticus corpus, by introducing the Index Thomisticus Treebank project.

Further, I will describe the original material owned by the 'Busa Archive' at Università Cattolica of Milan. By including press articles in the national and international media on Busa, correspondence between Busa and his contemporaries in Italy and abroad, material relating to particular phases of the Index Thomisticus and the Opera Omnia of Busa, the Archive represents an invaluable source of documentation for anyone interested in the history of the discipline.

3.12. Peter Robinson

Professor for Digital Methods in the Humanities, University of Saskatchewan

Changing the world, one angle-bracket and one license at a time

Scholarly editions, traditionally made by a very few people and looked at by only a very few more, may seem an unlikely starting point for an ambition to change the world. But consider this: almost all we know of the past and present comes to us through documents. Sometimes the documents are paper; increasingly, they are electronic and digital: television news, email messages, kindle readers, and (of course) the world-wide-web. Scholarly editing is all about documents: how they are made, transmitted, altered, read, republished, understood and misunderstood. That is what we do. A succession of scholars over the last decades, notably Jerome McGann on one side of the Atlantic and Don McKenzie on the other, have both broadened the scope of textual scholarship to every text in every document and argued for a shift of textual scholarship to the centre of scholarly discourse. The skills I need to disentangle the texts of Chaucer are the same as those I need to test politicians' statements about immigration. The

advent of mass document digitization and digital text encoding offers powerful tools we might use to realize a world where everyone may test every statement, every document. First, the TEI and its partner technologies offer means to encode, link and distribute our understandings (and misunderstandings). Second, the advent of open licensing regimes may open access to knowledge without barriers. However, there are powerful forces acting against this vision: not least, the desire of many academics to retain their privileged ownership of knowledge. This paper will reflect on what we, as scholars and digital humanists, can do within this changing environment.

3.13. Geoffrey Rockwell

Professor of Philosophy and Humanities Computing, University of Alberta

Thinking-through things like analytical tools

Woven through the history of the digital humanities are practices of thinking through the analysis of texts. Analytical tools have been presented as a telescope for the mind that extend our sight. This paper is about the thinking that happens through analytics. I will draw on what tools developers have said about the thinking interaction with the text that is enabled. I will show experiments in replicating past analytic techniques and how such experiments can be documented through literary programming notebooks. To conclude I will argue that thinking-through is more inclusive way of understanding the praxis of the digital humanities.

3.14. Michael Sperberg-McQueen

KIVA Visiting Professor for Internationality and Interculturality, Technische Universität Darmstadt; Black Mesa Technologies LLC

What does descriptive markup contribute to digital humanities?

Descriptive markup is not, perhaps, the most important concept in the digital humanities, but it has been historically important; this paper attempts to identify its key parts and their significance.

- 1 Documents have structure worth exposing.
- 2 No predefined set of primitive notions will be adequate for a general-purpose document representation language; it must be possible for users to define their own sets of basic notions (in XML terms, their own element types and attributes).
- 3 Documents can be made reusable by representing them in an application-independent, vendor-neutral format.
- 4 A practical consequence of 2 and 3 is that documents will be most useful when users specify not how the different parts of a document should be processed, but what they are.
- 5 In general, the best results are obtained when document markup is declarative (not imperative) and descriptive (not tied to display, layout, or any other form of processing).
- 6 The natural interpretation of SGML and XML describes a document as a directed acyclic graph of nodes, whose arcs are defined either by the parent-child relation holding between elements or by

ID/IDREF pointers connecting elements in the document, and whose nodes are decorated with sets of attribute-value pairs. From this graph structure, simpler structures such as trees and sequences can be created by projection (systematically ignoring parts of the information in the graph) and other structures can be created (or simulated) by suitable interpretation of arcs or by restructuring the data under program control.

7 Using the tree structure inherent in the elements of an XML document, a context-free grammar can be used to validate the input against user-defined expectations. Valid documents are labeled bracketings of trees generated by the context-free grammar.

That these are not the truisms or meaningless phrases they might at first seem, may be illustrated by document processing tools and word processors which treat documents as flat sequences of characters, without any particular structure, or as flat sequences of differently styled paragraphs each consisting of a flat sequence of differently styled characters; which pre-define a set of semantic primitives in terms of which all documents must be interpreted; which use proprietary data representations without published specifications; which do not allow for declarative or descriptive identification of document structures; and which provide no user-controllable means of imposing constraints or distinguishing structurally sound documents from data corrupted in transmission.

There has been a good deal of discussion of the adequacy of tree structures for the representation of documents, sometimes coupled with proposals for alternative structures. It is worthwhile to consider this topic in the context of larger considerations about the adequacy and suitability of data structures in general.

3.15. Manfred Thaller

Professor für Historisch-Kulturwissenschaftliche Informationsverarbeitung, Universität zu Köln

Automation on Parnassus - Clio / κλειω and Social History

In the methodological discussions of the sixties and seventies in the historical disciplines information technology was originally seen as almost inseparable from quantitative methods. Particularly in hindsight it is frequently overlooked, that the question whether historical sources provided data which could be fed into standard statistical software, was discussed quite intensively at the time. Particularly in social history, playing a key role in the period when social science was the main target of interdisciplinary aspirations of the field, there existed a discussion, often connected to the journal “Historical Methods”, which focused very early on the representation of huge networks of factoids extracted from historical sources and their analysis. To support such research in 1978 at the then Max-Planck-Institut für Geschichte (History) the development of software dedicated to historical research has been started. Conceptually based upon a concept of “source-oriented data processing” this led to the software system CLIO, later κλειω, which supported the analysis of graph oriented data bases of millions of nodes, embedded into a processing environment, which offered a number of domain specific services, up to an implementation of the Latin lemmatization developed by Bozzi in Pisa. In later years it was used to power XML based digital libraries, a few of which are still operational.

The presentation focuses on (a) the conceptual model behind that development, (b) the data model derived from it, (c) the architecture of the software supporting the approach and (d) some parallels in recent research.

3.16. Joachim Veit

Professor der Universität Paderborn, Editionsleiter der Carl-Maria-von-Weber-Gesamtausgabe

Outside - inside: Two aspects of the digital turn in musical editing

Musical editing – as a central field of musicology – has been in an ongoing state of change since several decades and despite the special conditions of „musical objects“ it was heavily influenced by the challenges of text editing starting in the 1970s. Nevertheless the „digital turn“ seems to be of a still more fundamental and dramatical influence on musical editing and even on musicology in general. The first step of this „turn“ was a more technical one: New tools for digital editions of music facilitated the work of editors and allowed to make editorial decisions more transparent for the reader. At the same time the focus of editing began to shift, because a new interest in the act of writing, copying and printing resulted from intensive use of these new tools. But nothing proves to have a more revolutionary impact on music editing than the next step of this „turn“: the rise of new forms of representing „musical objects“: Especially the development of the new scholarly standard by the Music Encoding Initiative (MEI) leads to new concepts of editing and at the same time provides the basis for new forms of research, not only in the editorial context but also for several other fields of musicology. The relevance of this important step should not be underestimated and in my paper I shall try to outline a few of the consequences which are already visible at the horizon – without being tacit about the huge problems which we still confront on our way in the new „digital world“.

4. Key ideas and concepts of DH: programme (24.10.2015)

	Mon, 26.10.2015	Tue, 27.10.2015	Wed, 28.10.2015
09:30		Perspectives on some key developments in text-based applications Susan Hockey	Looking for Gender in the History of Digital Humanities Julia Flanders
10:00		Digital Humanities - The long way to teaching and learning a new epistemology. Some reflections Elisabeth Burr	Philology and text technology Claus Huitfeldt
10:30		coffee break	coffee break
11:00		Designing humanities computing tools: insights from a 49-years trip from assembler programming to an XML-based toolbox Wilhelm Ott	The TEI Legacy: Where we have gone from there Nancy Ide
11:30		Using large text collections for text analysis Fotis Jannidis	Key concepts and ideas of Digital Humanities DHDarmstadt
12:00		Thinking-through things like analytical tools Geoffrey Rockwell	Final discussion and farewell
12:30		lunch break	lunch
13:00	arrival at conference venue		
14:00	Conference welcome Andrea Rapp	Digital challenges to scholarly editing Hans Walter Gabler	
14:30	What does descriptive markup contribute to digital humanities? Michael Sperberg-McQueen	Editions printed and/or digital Kurt Gärtner	
15:00	It's all Google's fault George Landow	Outside - inside: Two aspects of the digital turn in musical editing Joachim Veit	
15:30	coffee break	coffee break	
16:00	Great expectations seeding forests of trees. Some key ideas of Digital Humanities in Father Busa's own words Marco Passarotti	Changing the world, one angle-bracket and one license at a time Peter Robinson	
16:30	Automation on Parnassus - Clio / κλειω and social history Manfred Thaller	podium discussion	
17:00	social programme		
17:30		reception	