

An Audiovisual Concept for a Large Faculty with Reference to Didactic Applications

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A: Introduction: Project Description

The aim of this paper is to present research goals for a proposed study on the establishment of faculty-wide infrastructure for audiovisual streaming media¹ at the Faculty of Humanities at the University of Vienna.

The conviction of the author is that technological *convergence*,² broad-bandwidth *internet*³ and third generation *telecommunications*⁴ are destined to reshape the nature of information exchange in general, and higher education in particular. The implications of this for humanities teaching and research are considerable, not only in the established field of *digital resources for humanities*, but in many departments of humanities study.

The academic community has been forever challenged to incorporate new technologies into its methods, and indeed will be expected to lead the way in the cogent and productive integration of streaming media into both research and education. However, the future role of the University will be defined not only in terms of its ability to access new channels of information exchange, availing itself of them for syllabus and scholar, but more challengingly to create *streaming media content* relating to its various disciplines. In order for this to happen, staff have to have access to infrastructure, instructions on how to use it and a clear understanding about which objectives can be attained.

The role played in the humanities by 'real time' content such as language, by the study of 'data intensive' objects such as manuscripts, images and sound, by frequent

1 Streaming media are telematic exchanges of audio, video, image, and other data in real time. As a term central the new communications, 'streaming' indicates computing applications where two or more computers, exchange and compute data as they are sent, without first having to download then compute.

2 "What is convergence? Traditionally, communications media were separate. Services were quite distinct - broadcasting, voice telephony and on-line computer services. They operated on different networks and used different "platforms": TV sets, telephones and computers. Each was regulated by different laws and different regulators, usually at national level. Nowadays digital technology allows a substantially higher capacity of traditional and new services to be transported over the same networks and to use integrated consumer devices for purposes such as telephony, television or personal computing." Quoted from the European commission paper of the 3rd Dec 1997 at <<http://www.eubusiness.com/mediacom/971203co.htm>>

3 "The Internet to date has been primarily text and graphics. [Broad bandwidth Internet such as] Internet2 will deliver full-colour, full-motion, full-screen video and CD quality audio, 3D virtual reality movies, real-time simulations and immersive environments. It will also enable world-wide access to digital libraries like the one at Vanderbilt, which features thousands of hours of television news broadcasts □ a boon to researchers in the humanities." Joe Mambretti, director of the International Center for Advanced Internet Research at North Western University <<http://www.forbes.com/asap/html/99/0630/feat.htm>>

4 "1st generation mobile communications provided analogue voice communications, 2nd generation provided digital voice and data communication (GSM, DAMPS, PDC,IS-95), 3rd generation will provide multimedia capabilities such as high bit rates(2 Mbit/s) and packet data and Internet provider access." Rajesh Banerjee at <http://www.ee.vt.edu/yufei/wcdma/Rajesh_file/sld001.htm>

information exchanges with other cultures,⁵ as well as by the demands of normal academic communication – all of which lend themselves to streaming media usage – make the humanities pre-eminently suited to benefit from these developments.

Already the Faculty of Humanities has a well-developed EDP⁶ infrastructure, and many staff and students use telematics, word processing etc. as naturally as the book. For hypertext and graphic applications, existing structures are doubtlessly adequate. The next generation (*NextGen*) technologies, however, with their emphasis on audiovisual content, require new, more complex infrastructure and skills, which are not yet available to the whole Faculty.⁷ These skills are bound to become a measure for the Faculty of its ability to anticipate changes in the way we exchange information, its understanding of techniques that will affect all of tertiary and secondary education, and its desire to play an active and critical role in the shaping of the information society.

At its core, humanities teaching will always be *inter-personal*, its object and subject *human*. The new media and streaming media will be a mirror of that fact and not its antithesis. The humanities' assets are interpretative, creative and spiritual. But technologies of distribution – and those include not just the printing press or microfilm, but internet and, soon, broad-bandwidth streaming media – have always been eagerly enlisted to disseminate those assets. Beyond this, the humanities community has traditional strengths in assessing, filtering and explaining information. It is almost obliged to monitor the quality and consistency of information the 'information society' outputs, much of which is sub-standard. The humanities have already taken on that role through their involvement with issues of code which will be readable by future historians,⁸ text standards,⁹ the philosophy of internet society,¹⁰ internet searchability¹¹ and other major issues.¹²

5 Where UNICODE, the standard for character sets of non-Latin alphabets, UNL (universal net language), a generative grammar -based translation standard being developed internationally at the United Nations University in Tokyo and planned for 2002, or already existent audio translation (automatic interpreter) software such as Linguatrec's *Talk and Translate*, which received the European Information Technology Prize in 1998, will play their part.

6 EDP is Electronic Data Processing, the equivalent of the much-used German EDV (Elektronische Datenverarbeitung).

7 Nor indeed at most European universities, since the *NextGen* technologies will only be implemented in the coming two to three years or more.

8 "Into The Future: On The Preservation Of Knowledge In The Electronic Age", produced by Terry Saunders in association with the American Council of Learned Societies (ACLS) and the Council on Library and Information Resources (CLIR). The film has been shown on PBS TV channels across the United States is being distributed as a video by the American Film Foundation." Further information and resources, discussion, and a streamed clip of the film are available from web pages on the CLIR site at <<http://www.clir.org/film/intro.html>>

9 The Text encoding Initiative's work on TEI-SGML or TEI-XML are the most notable examples.

10 And not only this but the effect of computing on philosophy itself. See Terrell Ward Bynum and James H. Moor (ed.). *The Digital Phoenix. How Computers Are Changing Philosophy*. Oxford 1998. The book is cited by Herbert

Our main objective during this proposed period of research will be to report to Vienna University's Faculty of Humanities on forthcoming developments in the field of technology convergence, audiovisual streaming and broad-bandwidth internet, as they become relevant to higher education. As humanists, our concern will be to provide the tools our colleagues may need, not just to survive an imminent revolution of communication, but to thrive in it and project their subjects' timeless messages of truth out to the information highways of tomorrow.

B: Project Aims

1. To monitor international developments in audiovisual and streaming media as they apply to higher education (as presented in initiatives such as *ACO*HUM*, *ICDE*, *LTSN*, *EMTF*, *SITE 2000*, *ED-MEDIA* and so forth)¹³ and to assess their applicability to the needs of the Faculty of Humanities at the University of Vienna.
2. To centrally record existing projects at the Faculty (also a recommendation of the Vienna University *Logistic Centre Workshop* in October 1998).¹⁴

Hrachovec in his abstract on his paper *FAQ: Computers and Philosophy* at
<<http://www.hd.uib.no/AcoHum/fh/>>

11 The Dublin Core has created international standards for web citation. See
<<http://www.dlib.org/dlib/june97/metadata/06weibel.html>>

12 Such as the purported effect of humanities on computing: "The findings [of the SOCRATES survey on Humanities and Digital education] are overwhelming, but not entirely unexpected: the pervasive influence of the information age is the single most important factor that has brought about changes in humanities education during the past decade. Perhaps less expected is that the humanities are also changing computing, and are helping to transform computers from being calculators into machines that talk and listen." Koenraad de Smedt, in *Computing in Humanities Education, a European Perspective* (ACO*HUM), University of Bergen, 1999, chapter 1, section 1.1.

13 EMTF is the Educational Multimedia Task Force of the European Union. It encompasses research and development in telematics, information technology and socio-economic research, education and training with the programmes SOCRATES and LEONARDO DA VINCI and the trans-European networks TEN-telecom. See
<<http://www2.echo.lu/emtf/>>

The other acronyms are Advanced Computing for Humanities, the International Council on Distance Learning, (both discussed in Chapter E) and the Learning and Teaching Support Network
<<http://www.ilt.ac.uk/ltsn/index.htm>> which is the follow-on from the *Computers in Teaching Initiative*
<<http://www.cti.ac.uk/>>. SITE 2000 is the US conference of the Society for Information Technology and Teacher Education. This society "represents individual teacher educators and affiliated organisations of teacher educators in all disciplines, who are interested in the creation and dissemination of knowledge about the use of information technology in teacher education and faculty/staff development." <<http://www.aace.org/info.html>> ED-MEDIA 2000, to be held in Montreal, Canada on June 26 - July 1, 2000, is styled as the World Conference on Educational Multimedia, Hypermedia & Telecommunications, sponsored by the Association for the Advancement of Computing in Education (AACE). "This annual conference serves as a multi-disciplinary forum for the discussion and exchange of information on the research, development, and applications on all topics related to multimedia, hypermedia and telecommunications/distance education."

<<http://www.aace.org/conf/edmedia>> See too *Educating for the Third Millennium*, An IT Network Conference
<<http://www.itnetwork.org.uk/conf2k.html>>

14 <<http://hhobel.phl.univie.ac.at/~herbert/lv/nmprot.html>>

3. To set up, or participate in, an information exchange on teaching technology to humanities students (an 'educational brokerage,' as called for in De Smedt, 1999).¹⁵
4. To provide 'how-to' guides for the subsequent production of digital resources,¹⁶ in particular taking heed of the expected augmentation of hypertext-enhanced education by streaming media usage (cf. TASI, *Technical Advisory Services for Images*).¹⁷
5. To inform non-specialist Faculty members about how telematics and audiovisuals can be applied to their subjects.
6. To set up a library of resources to be made available to Faculty teachers (also through consultation with libraries such as HCU at Oxford,¹⁸ Surrey¹⁹ or MSU²⁰), including peer-reviewed webzines like JIME²¹ and an internet culture depository.
7. To make recommendations based on a close monitoring of technology development (both in research, such as at IICM in Graz,²² other Austrian centres²³ or ECMAST²⁴ and in user systems, such as DV-editing, streaming servers, video-conferencing via WIDs,²⁵ wavelet imaging, 24bit audio etc.) for the setting up of the Faculty's existing, but dormant, audiovisual centre.²⁶

15 "In our experience, the willingness to change humanities education is real but must be supported by substantial international infrastructural measures to secure co-operation and efficiency. Among the necessary measures we name the establishment of an international repository of computational resources, a brokerage for competence in teaching expertise, and technical and organisational support for transnational distributed ODL." De Smedt at < www.uib.no/acohum.>

16 Much in the way that hands-on material to assist staff creating digital resources has been provided by SURA, the Southern Universities Research Association, and its 'cookbook' on video-conferencing.

17 <<http://www.tasi.ac.uk>>

18 <<http://www.hcu.ox.ac.uk/>>

19 <<http://www.surrey.ac.uk/Library/>>

20 <http://www.lib.msu.edu/e_res/ Michigan State University Library>

21 The Journal of Interactive Media in Education <<http://www-jime.open.ac.uk/>>

22 The IICM (Institute for Information Processing and Computer Supported New Media) <<http://www.iicm.edu/>> has several interesting projects, both in software development and content for educational IT. Resources are the *literary corner for unpublished Styrian authors*, the *telematic museum*, <http://druckarchiv.kleinezeitung.at/telematisches_museum> or the *Liberation library*. Software research centres on GENTLE, Hyperwave, J.UCS, VRwave and the HM-card. The IICM has been inventive in regard to technology education, see Chapter E.

23 For an overview of Austrian developments, including the activities of BIT (*Büro für internationale Technologiekoooperation*) <<http://www.univie.ac.at/bit/>> see

<<http://www2.echo.lu/telematics/education/en/projects/profiles/austria2.html>> It should be pointed out, however, that this European Union website was compiled in 1996 and is not current. The Institute for Software Science <www.par.univei.ac.at> is, for example, quoted as being involved in research in higher education and computing, which is no longer the case.

24 ECMAST is the European Conference on Multimedia Applications, Services and Techniques. ECMAST is the leading European venue for multimedia research, in compression, transmission, middleware and content. It does not have its own website, but resides at the hosting institution's site.

25 Wireless Internet Devices

26 The AV Zentrum is situated in the University Campus, AKH, Alserstr. in courtyard 2.

8. To report to the Faculty on bandwidth (e.g. introduction of UMTS in 2002²⁷), also gathering information on related projects, such as *Internet2*.²⁸
9. To take existing AV-equipment, which is available to the author of this research proposal,²⁹ and use it as pilot research infrastructure to gauge the needs of the Faculty.
10. To create actual resources for use within the Faculty and to measure their effectiveness in teaching environments.

The *NextGen* technologies will enable a host of new usages, much of it as yet undefined and untried. Structures central to university teaching such as the lecture and the seminar will be mirrored in multiplexed conferencing.³⁰ Language as an interactive audio experience, fundamental as it is to the humanities field, will become accessible through high-resolution telematics, in combination with visual information. Convergence of high-bandwidth internet, mobile telephony, digital television and video will enable the University to add to existing structures with new methods of knowledge dissemination, inter-university communication and research or teaching. New media audiovisual tools will in themselves add ingredients to the eternal canons of humanities research, those of human civilisation, its languages, art and history. The new techniques will function not only as vehicles of knowledge but as a source of learning in themselves, furnishing humanities graduates with information they will be called upon to know in the world beyond the university's perimeters.

C: Infrastructure and Projects at the Faculty of Humanities

In the course of preparing this application, the author interviewed heads of departments (*Institutsvorstände*) throughout the Faculty of Humanities at the University of Vienna, to gain a picture of present EDP- and hypermedia-supported projects and future needs. It can be fairly said that the general mood is one receptive to new methods, as far as they satisfy real needs of Institute and Faculty, and one supportive of forthcoming initiatives.

²⁷ Universal Mobile Telecommunications System. Also designated as UMTS/IMT 2000. The Universal Mobile telecommunications System is a 3rd generation standard. See its forum at <<http://www.umts-forum.org/>> where there is also a PDF downloadable paper on the standard.

²⁸ <<http://www.internet2.edu/>>

²⁹ an equipment list has been appended to this paper (Appendix 2).

³⁰ functioning with more reliable protocols than the present H.323 standard.

Present faculty infrastructure, managed by head of Central Information Services³¹ Dr. Peter Rastl,³² is copious and adequate in dealing with hypertext usage, OCR,³³ graphics and, to a certain degree, digital imaging. There is the EDP centre's teaching of *Office, Access, PhotoShop 5* and *Unix*; there is its RS6000 timesharing, standard software service, publication listing, its EDP-repair pool and network card service. There are a good number of PC rooms, not to mention the Institute of Translation's language labs.³⁴

Most institutes have their own website e.g. the comprehensive site of the Institute of European Ethnology,³⁵ and other resources such as image documentation of excavations³⁶ or web links for social history.³⁷ Sub-projects may also have their own site such as *GesamtMedialeAnthropologie*³⁸ at the Department of Romance Languages.

Several members of the Faculty have undertaken solo and group projects. Exemplary for language teaching and web design are the *Lateinergänzungsprüfung* website³⁹ by Dr. Weidmann, software development for extra-European languages (the *Hausa* project at the department of African studies)⁴⁰ by Dr. Stoiber and *Baustein Tschechisch*, a large scale language-learning project by Prof. Gero Fischer, which incorporates audio CD materials.⁴¹ Imaging features in large scale projects for digitising archived photographs (using a *Kodak DCS 330* digital imaging system) at the Institute for Modern History⁴² or two major imaging projects at the Institute for Classical Archaeology,⁴³ the *Electronic Image Safe and Search System* EISSS⁴⁴ and the *Archaeological Databank of Historical Photographs*,⁴⁵ both by teams led by Prof.

31 The German title is the *Zentraler Informatik Dienst* <<http://www.univie.ac.at/ZID/>> See too the VUCC/ACOnet at, for example, <<http://www.vix.at/vix-services.html>>

32 In September 1999 Peter Rastl was the subject of an extensive article *Masters of the University: Studieren im Internet-Zeitalter* in a special issue of *profil*, the Austrian news magazine, entitled *Die HiTech Universität*, p.6. An overview of the role of the University in the Internet was given by Peter Rastl in his talk on "The University of Vienna and Internet in Austria" at the ACS on the 20th April 99. His abstract in German is at: <<http://www.pri.univie.ac.at/~renatem/kolloquium/koll7.html>>

33 Optical Character Recognition systems enable the use of scanners to 'read' printed text as ASCII or Unicode, saving the laborious task of re-typing texts into word processors.

34 <<http://www.univie.ac.at/transvienna/>>

35 <<http://www.univie.ac.at/volkskunde/>>

36 *Das bawarische Gräberfeld und die Siedlung von Zillingtal, Burgenland* by Prof F. Daim at <<http://www.univie.ac.at/urgeschichte/pers/daim.htm>>

37 <<http://www.univie.ac.at/Wirtschaftsgeschichte/>>

38 <<http://www.univie.ac.at/romanistik-textwissenschaft/>>

39 Created by Clemens Weidmann. See <<http://www.univie.ac.at/latein/>>

40 *Phonological analysis of Hausa* by Franz Stoiber

41 <<http://www.univie.ac.at/slawistik/Fischer.PDF>>

42 *Datenbank und Handbuch fotografischer Quellen Österreichs*. by Prof. Gerhard Jagschitz, Michaela Pfundner and Robert Pfundner, see <<http://www.univie.ac.at/zeitgeschichte/>>

43 <<http://www.univie.ac.at/Klass-Archaeologie/>>

44 by Prof. Krinzinger, and Boesch, Ehrenhöfer and Kopf

45 by Prof. Krinzinger, Kucher, Pedrazzi and Wetzer.

Krinzinger. Audio is represented by Dr. Lubaj's authoring of the *Emap* digital audio software at the Institute for Musicology⁴⁶ and the activities of Dr. Werner Deutsch, Austria's foremost psychoacoustician.⁴⁷

An expansive analytical onomasticon project is the *Lexicon of Ancient Names in German Texts of the Middle Ages*⁴⁸ by Prof. Ebenbauer et al. Questions of New Media Culture have been dealt with by H. Gruber at the Institute of Linguistics⁴⁹ in his work on *Scholarly Communication and New Media*, and at the Department of Comparative Literature by Prof. Bachleitner, as well as in web-published papers on New Media by E. Grabowski,⁵⁰ while the Department of English features Prof. Mayer's *On the Road in American Culture: an Internet Anthology*,⁵¹ which has textual, audio and visual content, and the work of Dr. Nikolaus Ritt,⁵² who along with Drs. Eder, Fuchs and Gruber, participated in the workshop *Neue Medien in der Lehre*.⁵³

Institutes have incorporated digital resources in their teaching programmes. Internet-assisted teaching initiatives have been set by Prof. Wolfgang Schmale at the Department of History⁵⁴ incorporating a range of web history resources. Prof. Gero Fischer has created PowerPoint presentations on his projects, such as *Czech Theatre in Past and Present Vienna* or material for discussions of contemporary Russian folk music, combining video images, text and music into CD-Rom resources which

46 The *Emap* software authored by Dr. Emil H. Lubej, see <<http://www.emap.cc/>>

47 Dr. Werner Deutsch, whose name comes up at many a conference on the digital future, lectures at the Department of Musicology, while teaching a full set of courses on psychoacoustics at the Department of Psychology, (see <http://www.kfs.oeaw.ac.at/students/PSA_2000.htm>). He is the director of the Acoustic Research Department of the Austrian Academy of Science <<http://www.kfs.oeaw.ac.at/>> and has developed the software, *S_TOOLS X for Windows95/NT*, of whose RTSA he writes, "The Real Time Spectrum Analyser is part of a larger software package providing digitization, sound data storage and sound archive management. Easy metadata generation is supported. Signal segmentation, fundamental frequency extraction, formant frequency extraction, FFT-transform and Wigner distribution frequency analysis can be performed within one comprehensive software package." Deutsch is a member of the HARMONICA EU sponsored libraries programme, the Austrian Acoustics Association, the ÖPG Acoustic Section, the Audio Engineering Society and the oEAL initiative on noise reduction. He has created comprehensive audio-supported websites, streaming media resources on mechanical musical instruments and ethnic music styles.
<<http://www.kfs.oeaw.ac.at/DLI/mech/dlidem1.htm>>.

48 <<http://www.univie.ac.at/Germanistik/>>, *Lexikon der antiken Namen in deutschen Texten des MA* a project by Prof. Alfred Ebenbauer, M. Kern, S. Krämer-Seifert and B. Mattig-Krampe.

49 <<http://www.univie.ac.at/linguistics/>>

50 Prof. Bachleitner or E. Grabowski at <<http://www.arts.ualberta.ca/clcwebjournal/clcweb99-3/grabovszki99.html>>

51 <http://www.univie.ac.at/Anglistik/easyrider/data/on_the_road_in_american_culture.htm> by K. Mayer

52 <<http://angam.ang.univie.ac.at/staff/nr/>>

53 <<http://hhobel.phl.univie.ac.at/~herbert/lv/nmprot.html>> The workshop was organised by the Centre for Logistics and took place on the 28th of October 1998. The Faculty of Humanities was represented by Ritt, Gruber, Eder and Fuchs and many of the findings of the workshop were relevant for the Faculty. Proposals were for lists of activities, teaching of new media, pilot projects e.g. an educational server, complaints that the EDP representatives at each institute were overburdened etc. Many of these points have reappeared in this paper in regard to audiovisual media.

54 <<http://www.univie.ac.at/igl.geschichte/>>

students can use at home.⁵⁵ The Department of Judaic Studies uses a CD-Rom resource *Navigating the Bible* to teach students the pronunciation and intonation of Hebrew texts from the *Torah* and the *Haftarot*.⁵⁶ Dr. Liliana Ruxandoiu-Ionescu and Prof. Rössner have illustrated their *Play Theory seminar* with a web resource.⁵⁷ Prof. Johannes Divjak utilises a digitised Latin bible, enabling advanced text analysis, and amongst his many other projects, has created a professional CD-Rom philology resource on Ancient Egypt.

UNICODE, the ISO standard 10646 for multiscrypt computing,⁵⁸ plays a major role for departments using non-Latin alphabets, such as the Institute for Oriental Studies under Profs. Ladstätter and Linnhart.⁵⁹ Teething troubles with multiscrypt computing in Windows systems have been the subject of the UNET site *Computerecke*.⁶⁰

Projects may well go beyond the Faculty itself, like the Department of Egyptology's participation in the international data management-assisted *Synchronisation of Civilisations in the Eastern Mediterranean in the 2nd Millennium BC* (SCIEM),⁶¹ led by Prof. M. Bietak, also involving the Institute of Near Eastern Studies under Prof. Hunger. Institutes are gaining experience in outsourcing manuscript data capture, as related by Japanese Studies' Dr. W. Manzenreiter.⁶²

Some institutes have expressed their desire to initiate special projects, or are considering embarking on the creation of a large digital resource. Two cases are the Department of Indology⁶³ where Prof. Karin Preisendanz has plans for *video-conferencing*,⁶⁴ and Prof. H. Tauscher at the Department of Tibetan Studies, who is considering *digital imaging* for his large-scale East Tibetan manuscript project.⁶⁵

55 <<http://www.univie.ac.at/slawistik/page87.html>>

56 The commercially available resource is published by Davka, see <<http://davka.com/cgi-bin/catalog/navbible.html>>

57 <<http://rs6000.univie.ac.at/~a7551uaa/>>

58 Unicode, which has ca. 65,000 slots for more than fifty world languages, is already supported in XML, Sun/HP, Netscape and Explorer browsers, Sybase Oracle, DB2, Office 98, Windows NT, Windows 2000 etc. It has been designated by China as a Chinese standard, GB13000. Latest approvals are Ethiopian, Canadian syllabics, Cherokee, Braille, Musical Symbols, etc.

59 as part of a reform in the university administration, called UOG95, the departments of Japanese and Chinese have become one department of Oriental Studies. Prof. Ladstätter heads the former Sinology department, Prof. Linnhart the Japanese.

60 <<http://www.univie.ac.at/slawistik/page135.html>>

61 <<http://www.nhm-wien.ac.at/sciem2000/>>

62 <<http://www.univie.ac.at/Japanologie/shokai.htm#WM>>

63 <<http://www.univie.ac.at/indologie/>>

64 At present there are three avenues the Department could take:1) H263 (for ISDN throughput at 128Kbit/s) or H323 compatible stand-alone systems such as the *Tandberg Educator* or Sony *Trinicom*, which are expensive, 2) cheaper PCI solutions such as *Kodak DVC 300* or *Creative Labs Webcam 3* with Microsoft's NetMeeting <<http://www.microsoft.com/windows/netmeeting/?RLD=52>> whose functionality may not be satisfactory for

Although strictly speaking not a member of the Faculty,⁶⁶ the Philosophy department's Dr.H.Hrachovec⁶⁷ is a prominent member of the digital resources community, overseeing trenchant content on the Austrian web.⁶⁸ Physically near to the Faculty is the *Institute for Computer Science and Business Informatics*,⁶⁹ whose Prof. Günther Vinek numbers amongst the academic world's leading Object Oriented Programming (OOP) and *Smalltalk* researchers.⁷⁰ His department's introductory lecture resources on OOP⁷¹ are accessible on campus from the Humanities' UNET PC rooms.⁷²

It is true to say that the Faculty's experts on EDP, such as Prof. Johannes Divjak, who collaborated with the acknowledged founder of Humanities Computing Roberto Busa SJ,⁷³ and Prof. Gero Fischer, an early protagonist of computer-aided learning (CAL), are aware of its associated problems. Prof. Fischer stresses the thorny issues of data preservation,⁷⁴ granularity and resolution issues, and what he terms the *Video 2000* phenomenon, i.e. technology obsolescence of (sometimes superior)

more than one-to-one communication, or 3) to await the setting up of infrastructure using xDSL (digital subscriber line) transmission and SURA guidelines at a purpose-installed AV centre within the Faculty itself.

65 TASI provides very good advice based on the experience of large scale projects: at <http://www.tasi.ac.uk/building/elise2.html> For example: "The images will be digitised 35mm slides using a Kodak Slide Scanner and a Linotype Sapphire Flatbed Scanner. Image manipulation software used include PhotoShop (for PCs) and Image Alchemy (which is cross-platform and allows complex batch processing). 35mm slides are checked for colour casts (e.g. pink or blue), dirt, deformation, mount skew and matching to textual record.... There will be approximately 40,000 images in the final resource. Digital masters will be stored off-line as TIF format of c.18MB each, from black & white up to true colour (24 bit), [not] GIF and BMP because of their colour depth and proprietary status."

66 Since, at Vienna University, philosophy belongs to a different faculty, *die Grund- und Humanwissenschaftliche Fakultät*.

67 Dr. Hrachovec has assisted humanities departments e.g. the Institute for Romance Languages, in setting up websites and resources. He teaches *Digital Resources for Philosophy*, enquires in his *FAQ on Computing and Philosophy* into semantic questions such as what is an e-mail, has delivered a seminal paper at the ACO*HUM' conference in September 1998, see <http://www.futurehum.uib.no/> and is a Laurence Sterne-inspired webmaster and philosophical cyberauthor in one.

68 <http://homehobel.phl.univie.ac.at/>

69 Or to give it its full title: *Institute für Informatik und Wirtschaftsinformatik* at <http://www.ifs.univie.ac.at/>

70 See Vinek, G. *Objektorientierte Softwareentwicklung mit Smalltalk* Springer-Verlag (1997) Reihe: Objekttechnologie, 440 Seiten, or his *Dynamisches Reverse Engineering in Smalltalk* in: *Softwarewartung und Reengineering, Erfahrungen und Entwicklungen* (F. Lehner, Hrsg.) Deutscher Universitätsverlag (1996) (in collaboration with F. Penz).

71 OOP theory is central to e.g. Java, the main internet programming language

72 <http://www.pri.univie.ac.at/scripts/scripts.html>

73 see Busa R., Concluding a life's safari from punched cards to World wide Web in: *The Digital Demotic; a selection of papers from Digital resources in the Humanities 1997*, ed. Burnard, L. et al. London, OHC, 1998, pages 3-11.

74 For a practical discussion of this theme relating to the U.S. National Archives see Alexander Stille's *Overload*, in: *The New Yorker*, May 8, 1999, pages 38-44. It is hoped that human and machine readable code, in particular the new XML standard, which allows future historians to read text without the program it was written with, will improve the urgent problems facing the data storage community.

systems.⁷⁵ Prof. Divjak has dealt with problems of functionality in large scale resources.⁷⁶ He has also introduced courses in Humanities EDP, activities that were well before their time, and knows the difficulties of leading humanities students into the realms of technology.

Closely informed about digital developments at the British Library,⁷⁷ the Institute for English Studies' Prof. Herbert Schendl has pointed out the high costs of subscriptions to on-line databanks, maintaining that CD-Rom resources are in the long run more economical.⁷⁸ The Language Laboratory, which boasts a new *Studer* computerised language system, has said that staff may need considerable encouragement to use infrastructure, even if it is installed and ready.

We have not to lose sight of the fact that those members of staff who have carried out the initiatives cited above and others are a small minority, and the majority of staff has yet to incorporate new technologies into their methods. This does not necessarily indicate outright hostility towards new means: full schedules and/or satisfaction with traditional methods are enough to keep staff away. Yet much has to be done in order to increase awareness, if only because society is demanding new skills from humanities graduates.⁷⁹

⁷⁵ "Despite missing several launch dates, when Video 2000 finally arrived in 1980 it was as revolutionary as [Philips] had promised....V2000 machines were also extremely sophisticated, using microprocessor control for all manner of trick-play and programming features. But the earliest machines were expensive and lacked features compared to VHS and Betamax machines... In 1985 the format was officially abandoned, becoming the first casualty of the Format War." <<http://www.popadom.demon.co.uk/vidhist/v2000.htm>>

Obsolescence of the normal kind is relevant, for example, when considering acquisition of digital imaging systems, where sensor resolution is leaping by half-a-million pixels every six months. At present the average consumer digital camera has a sensor averaging 2.1 million pixels, a Nikon D1 has 2.74 million pixels (<http://www.klt.co.jp/Nikon/Digital_SLR_Cameras/indexd1.html>) and the top systems, such as the Kodak DCS 660, have 6 million. A 35mm slide has between ca. 4 and 20 million pixels. See <<http://www.templetons.com/brad/pixels.html>>

⁷⁶ A Chadwyck-Healey resource which was subsequently out-performed by a more economical contender.

⁷⁷ And other developments such as the digitisation of the Middle English Dictionary, <P.Schaffner, University of Michigan, pfs@umich.edu> or the Middle English Grammar Project, <J. Smith@englang.arts.gla.ac.uk>

⁷⁸ An example which would seem to support Prof. Schendl's contention is the PCI (Periodical Contents Index) of Chadwyck-Healey. While providing access to a remarkable 10,000,000 article records, i.e. digitised periodicals in a wealth of subjects, a year's subscription costs ATS 280,000 [Euro 21,000] for 15 users.

⁷⁹ The demands on humanities graduates have been divided by de Smedt into three categories:

1. "jobs in traditional humanities-related professions which are faced with large scale telematics innovation (e.g. libraries, museums, archives, publishers);"
2. "jobs requiring the crucial integration of advanced computing methods into humanities-related professions (e.g. multimedia publishing, edutainment, translation technologies);"
3. "jobs where the knowledge and skills of humanities professionals is valued as an important new addition to traditional technology (e.g. human-computer interfaces, software localisation,). He continues to say that "The immense need for new humanities-related skills is addressed by a growing body of fundamental and applied research in computational linguistics and language technology, historical informatics, visual processing in history of art, computational logic, etc. The recently started 'cognitive revolution' has transformed the way we look at the human mind and its products, and has stimulated the use of computers as sophisticated modelling tools in humanities research." de Smedt, K. *Advanced Computing in the Humanities: a network approach*, 1998

Although arguably some components of audiovisual infrastructure exist in the Faculty, it is a fact that those members of staff using it cannot deal with the additional burden of spreading their knowledge to colleagues and students throughout the whole Faculty. That would seem to strengthen the call for the AV-centre to add to existing EDP-infrastructure and deliver services for imminent new technologies of communication and streaming media education to the Faculty's teaching and research staff.⁸⁰

D: AV, Streaming Media and Convergence

Historically speaking, the term *audiovisual* was already being used in print in the late nineteen-fifties⁸¹ and, from its inception, was associated with educational methods. Classical audiovisual methods (language teaching cassettes, slides for art history, photos and videos of excavations and foreign field trips, radio broadcasts, overhead projectors etc.) are so integrated in contemporary humanities higher education as to require no special introduction here. A renewed assessment of the scope of audiovisual media for the humanities is, however, urgently necessary as we enter an age of *streaming media*.

Streaming media can be defined as real-time applications and systems enabling the telematic dissemination of (high-bandwidth) synchronised audio and visual content via networks, intranets, broad-bandwidth internet, and high-capacity mobile telecommunications. Streaming media are sometimes referred to in connection with *new media*, a shifting term which may include new standards for publishing such as high-density data media (DVD)⁸² or the Super Audio Disc.⁸³

The present level of international research regarding the implementation of streaming media to higher education humanities is not high, judged in relation to total activities in the field of *digital resources and humanities*. Various factors can be postulated to explain this:

⁸⁰ Prof. G. Fischer has also suggested that a new AV-centre puts on demonstrations to encourage technology-shy staff to grasp its benefits.

⁸¹ "Audio visual aid: material such as gramophone records, tape recordings and various visual aids used as an adjunct to teaching." Harrod, L.M. in *The Librarians' Glossary*, 2nd Edition, 1959, 26.

⁸² For a comprehensive overview of the DVD-video publishing standard, as opposed to the use of the DVD as a data medium such as DVD-ROM, see the Sony DVD Manual, the current edition of which is available from Sony DADC Austria AG at customer service, Niederalm 282, A-5081 Anif, Austria. E-mail <sales@dadc.co.at.>

⁸³ a 24 bit, 96 KHz audio format developed in co-operation between Sony and Philips.

- a. The focus of Humanities IT⁸⁴ research has, by its very nature, been primarily on text (and the digital image as a carrier of text-based information through manuscript imaging, for example, in the British Library's *Electronic Beowulf* project).⁸⁵ Initiatives such as TEI-SGML,⁸⁶ TEI-XML and the Dublin Core⁸⁷ keep abreast of latest World Wide Web developments ("semantic internet"), and as such are standards on the move, requiring sustained efforts of co-ordination and research.
- b. Broad-bandwidth internet, and high-throughput telecommunications have not yet become everyday technologies, thus restricting the audience for streaming media applications and their currency as teaching methods.
- c. The infrastructure is not yet in place for humanities scholars to analyse and construct streaming media content,⁸⁸ although an awareness has already been formed,⁸⁹ as documented by the announcement of the 20th ICDE conference in Dusseldorf⁹⁰ or by discussions in the *Humanist* forum.⁹¹

Nonetheless, developments in the fields of real-time streaming media, mobile telecommunications and digitisation are rapid and global. A term central to those developments is **technology convergence**, or simply **convergence**. Convergence implies a fusion of existing technologies to create a unified 'hypertechnology', which will embrace present functions of the internet, mobile telephone, PC, television

⁸⁴ IT = Information Technology.

⁸⁵ <<http://www.bl.uk/diglib/beowulf/overview.html>>

⁸⁶ The TEI (Text Encoding Initiative) guidelines "specify a common interchange format for machine-readable texts, provide a set of recommendations for the encoding and representation of all possible features in the preparation of new textual materials, and document major extant encoding schemes, developing a metalanguage which allows the encoding schemes themselves to be encoded and described in a machine-readable form."

Quoted from the CETH website at:

<<http://scc01.rutgers.edu/ceth/intromat/introtext.html.tei>>

⁸⁷ "The Dublin Core is a metadata element set intended to facilitate discovery of electronic resources. Originally conceived for author-generated description of Web resources, it has attracted the attention of formal resource description communities such as museums, libraries, government agencies, and commercial organizations."

<<http://purl.org/DC/index.htm>>

⁸⁸ The fact that there is a need is emphasised by ACO*HUM which lists the following points:

1. "very few multimedia products have been available for the training of students at higher education levels, and particularly in the humanities.... The lack of available products is not surprising though, since humanities faculties are often dramatically under-equipped..."
2. "Furthermore, there have been few teachers with enough motivation to acquire advanced training in new technologies. This seems less due to lack of interest, than to the fact that keeping up with educational developments is not given as much academic credit as research....."
3. "Presently, bandwidth is still too low."

The conclusion is that "Faced with non-existing or immature infrastructures for using the new technologies in the academic landscape, European institutions of higher education policies should promote the technology mediated circulation of knowledge through innovative proposals and measures, stimulated by national and international measures."

⁸⁹ First steps are being taken, for example, in the new media classroom of the Center for History and New Media at George Masson University and the City University of New York:

<<http://chnm.gmu.edu/chnm/center.html>> "In the past decade new media and new technologies have begun to transform even the ancient discipline of history. CD-ROMS and the World Wide Web challenge historians to rethink the ways that they research, write, present, and teach about the past."

⁹⁰ The ICDE 20th Conference in Dusseldorf in June 2000 is also mentioned in chapter E.

(DVB-T), radio (DAB)⁹² and VCR.⁹³ Convergence is not futuristic. The technology is planned for market introduction as soon as 2002, in the case of high bandwidth satellite telephony.⁹⁴ The W3C consortium, ACTS and IETF's audio visual transport group and are just three international bodies addressing the issues.⁹⁵

Key transmission technologies are, for example, ATM,⁹⁶ UMTS (Universal Mobile Telecommunications System)⁹⁷ for satellite and wireless telephony or SDSL (Synchronous Digital Subscriber Line) for cable communication.⁹⁸

Central, too, to non-cable applications is the *Wireless Application Protocol* architecture specification, or WAP which, in the words of its official forum, is an "open, global specification that empowers mobile users with wireless devices to

91 See <http://lists.village.virginia.edu/lists_archive/Humanist/v13/0143.html>

92 "Convergence is calling in particular for the integration at service level of services traditionally provided over different infrastructures (e.g. the likelihood of combined service offerings using the mobile (GSM,UMTS) and broadcasting (DAB, DVB) infrastructures is quite large)." From: . Schwarz da Silva, B. Arroyo-Fernández, B. Barani, J. Pereira, D. Ikonou, J.L. Lavroff, F. Guirao, F. Sestini

Towards the 5th Framework Programme of EU funded RTD: *Information Society Technologies (IST) programme* European Commission, DG XIII-F.4,

<http://www.uk.infowin.org/ACTS/ANALYSIS/PRODUCTS/THEMATIC/NEWMOBILE/7-5th_frame.htm>
DVB-T (Digital video broadcasting) is a terrestrial television norm. It uses a compression mode called COFDM (Coded Orthogonal Frequency Division Multiplex). The United States is using the norm ATSC.

See <<http://www.dab-plattform.de/archiv/dabdvb/dabdvb.htm>>

DAB is digital audio broadcasting; see: <http://www.worlddab.org/dab/aboutdab_frame.htm> and <<http://www.eurekadab.org/>>

93 End users will have a variety of single devices to chose from, not necessarily PCs, but also WIDs (wireless information devices). Already an operating system for WIDs, called Epoc 32, has been adapted by the Symbian consortium, which includes mobile phone and palmtop manufacturers such as Nokia, Psion, Ericsson, Motorola and Palm Computing.

94 This is the date for the planned introduction of the Universal Mobile Telecommunications System (with a bandwidth of 2 Mbit/sec) in Europe.

95 <<http://www.w3.org/>>, Advanced Communications Technologies and Services

<www.cordis.lu/acts/home.html> and <<http://www.ietf.org/html.charters/avt-charter.html>>

96 Asynchronous Transfer Mode. See <<http://atmforum.com/>> "Asynchronous Transfer Mode (ATM) has been accepted universally as the transfer mode of choice for Broadband Integrated Services Digital Networks (BISDN). ATM can handle any kind of information i.e. voice, data, image, text and video in an integrated manner. ATM provides a good bandwidth flexibility and can be used efficiently from desktop computers to local area and wide area networks. ATM is a connection-oriented packet switching technique in which all packets are of fixed length i.e. 53 bytes (5 bytes for header and 48 bytes for information). No processing like error control is done on the information field of ATM cells inside the network and it is carried transparently in the network."

<<http://cne.gmu.edu/~sreddiva/Texttut.html>>

97 or to a lesser extent General Packet Radio Service, which is a stepping stone to 2 Mbit/s services.

<<http://www.gsmworld.com/technology/gprs.html>>

98 SDSL is more suitable for duplex communications than the slower ADSL. For an overview of xDSL, see the pdf deliverable <<http://www.cis.ohio-state.edu/~jain/cis788-97/rbb/index.htm>>.

easily access and interact with information and services instantly.”⁹⁹ Related to this is *Wireless Markup Language*.¹⁰⁰

Discussion regarding the questions of technology convergence is in full swing at the highest political level.¹⁰¹ The significance attached to these developments is reflected in the wide-ranging green paper of the European Parliament, *Green Paper COM(1997) 623 Convergence of the Telecommunication, Media and Information Technology Sectors*.¹⁰² While much of Green Paper 623¹⁰³ is general, specifically education-orientated legislation had already been implemented in 1996¹⁰⁴ or in the MEDICI project.¹⁰⁵ The EU Fifth Framework Programme oversees related research and technological development.¹⁰⁶

Developments are being financed by governments, corporations, broadcasters, news agencies, copyright holders and universities, and as such are not inspired solely by the needs of education. The goals of e-commerce and the entertainment industry are a driving force, one which needs counterbalancing by the educational and humanities community. In a reversal of the development of the World Wide Web, initiated by Berners-Lee in CERN as a research tool¹⁰⁷ and only later becoming a medium embracing non-research use, convergence technology will from the outset

⁹⁹ “The WAP Forum is the industry association comprising over 200 members that has developed the de-facto world standard for wireless information and telephony services on digital mobile phones and other wireless terminals. WAP Forum members represent over 90% of the global handset market, carriers with more than 100 million subscribers, leading infrastructure providers, software developers and other organisations providing solutions to the wireless industry.” <www.wapforum.org>

¹⁰⁰ <<http://www.wapcongress.com/cr1299/>>

¹⁰¹ “Technological developments are also leading to a merging of the traditionally separate delivery platforms for images, text, sound and voice. ...It is possible that, in the coming years, increasingly rapid data transmission and consequent improvements in picture quality will enable premium content such as feature films to be distributed on the Web... This is essential if European broadcasters and producers are to be able to compete in a world where audiovisual material can be distributed equally and simultaneously over any platform.”

From: *The digital Age: European Audio-visual Policy*, Report from the High level group on Audio-visual policy chaired by Commissioner Marcelino Oreja, Directorate General X, Oct. 1998.

¹⁰² It is indicative of the depth of feeling and interest that this paper was the most downloaded EU document at its time of publication, and was responded to by numerous authorities and individuals including the Austrian Ministry of Science.

¹⁰³ <<http://www.ispo.cec.be/convergencegp/>>

¹⁰⁴ “[Our purpose is] to intensify the initial and in-service training of teachers and trainers in using multimedia software and on-line services.... Special attention should be paid to the analysis and understanding of the role of teachers and trainers, to providing research ...on the introduction of multimedia into teaching, [on] awareness of the benefits of multimedia and the conditions of its correct use, [on] support of teachers' initiatives, and [on] co-operation between educational and training institutions and the business sector on experiments in new teaching practices.” EU directive 396Y0706(03), Council Resolution of 6 May 1996 relating to educational multimedia software in the fields of education and training, *Official Journal C 195*, 06/07/1996 p. 0008 – 001. These ideas also hark back to the Banneman report of 1994, <<http://www-vatam.unimaas.nl/eductra/nl1/main.htm>>

¹⁰⁵ <<http://www.medicif.org/>> MEDICI stands for “Multimedia for Education and employment through Integrated Cultural Initiative.” It is a Framework of Co-operation established and supervised by DG XIII with DG X of the EU.

¹⁰⁶ <<http://www.cordis.lu/fp5/home.html>> There is also an RTD webzine.

be a common ground □ unfortunately also a *playground* □ of diverse usage, in which education will be challenged to assert its needs and the opportunities it perceives.¹⁰⁸

These opportunities are destined to change the face of education at large. The United States Senate, too, has reacted with the proposal of the *Digital Education Act* of 1999 ('S 1029'). The bill¹⁰⁹ details plans for primary, secondary and tertiary education. Notable is its Digital Education Content Collaborative (DECC).

America's efforts are not applicable to Europe, which has its own educational tradition and standards. Nevertheless, policymakers in the dominant IT cultures are aware not only of the educational significance of new media, but are making timetables for content introduction.¹¹⁰ Content is already there in spirit and name, if not yet in sound and image.¹¹¹ Course planning in Europe is destined to abound, as indicated by conferences such as *The future of the humanities in the digital age*.¹¹²

Many current developments in global commerce are paving the way for technology convergence, such as the fusion of AOL and Time Warner,¹¹³ Vodafone and Mannesmann, or Intel and Real Networks. We may well view these gigantic corporations and mergers with distrust,¹¹⁴ but as with Austria's Telekom, only the

107 Tim Berners-Lee, now chairman of the W3C consortium <<http://www.w3.org/>>, did not create the Internet but rather the technique of hyperlinks and the protocol which led to HTML.

108 It is to be hoped that the Third World will also profit from these educational developments. To quote Erkki Liikanen, member of the European Commission, at the Austrian Ministry Of Science home page <<http://www.bmwv.gv.at/food/gate.htm>> "Economic and technological developments in this area empower all sections of society. Innovation is bringing down the cost of access to information, to new technologies and services. The developed world was the "early adopter" - but who is to say that other parts of the world cannot use this technology to outstrip the developed world?". See also the Pan Commonwealth Forum at <<http://www.col.org/forum/subjectindex.htm>>

109 Introduced by Senators Thad Cochran and Edward Kennedy, which states that, "The content would be created in ways to fully take advantage of the new digital broadcasting capacity and the school computer and server infrastructure. It would be universally available to all teachers and students within a state or multistate collaborative. All new content created would include student assessment tools to give immediate feedback on student performance and mastery. ...Grants would be awarded on a competitive basis to states or multistate collaboratives for 3 years to allow time for the creation of a substantial body of significant content".

110 An example is EMAC, a Bachelor of Science Degree program in Electronic Media, Arts, and Communication jointly offered by the Department of Language, Literature, and Communication (LL&C), and the Arts Department at Rensselaer. "It provides students with the vital multidisciplinary education necessary for leadership in a rapidly transforming information society. It seeks to integrate aesthetic, creative, and critical thought with expertise in advanced electronic multimedia." <<http://www.emac.rpi.edu/program.cfm>>

111 Such as the Informedia II project: "The focus of Informedia-II is to improve both speed and accuracy of the underlying information extraction (now including interpretation of name, place, date and time references), and to address the challenges of dynamic story segmentation, speaker voice and face identification, and video event characterisation and similarity matching. The performance goals include real-time processing for analysis to enable contemporaneous incorporation into an active library, and interoperability across distributed proprietary video archives. Summaries rather than documents become the units of discourse." <<http://www.informedia.cs.cmu.edu/html/enter.html>>

112 See: Extended abstracts of a conference, Bergen, September 25-28, 1998. University of Bergen, HIT-senteret (also available at <<http://www.uib.no/acoHum>>)

113 Discussed for example in *Die Presse*, 12.1.2000, page 26.

114 The size of the companies involved and the danger of monopoly is real, and not just in the well-publicised case of *Microsoft*. The academic community has to propagate open standards, such as XML, and awareness about

largest companies can create communication systems. At any rate their endeavours □ and those of EU and US policymakers □ indicate how large the convergence issue has become.

We can discern two components in convergence use: first, the technology to manage transmission and networks, second, the skills and infrastructure to produce content. Our activities will be engendered by the second aim: to fulfil the prerequisites of content, thus placing the Faculty amongst those institutions of higher education duly prepared for the impending new age of information technology which convergence will surely usher in.

E: Status of Research: Sample Higher Education Projects

A good deal of thought has gone into the use of technology in higher education since the inception of mass computing. Already by the mid-Nineties, only shortly after the widespread advent of the World Wide Web, many activities for tertiary and secondary¹¹⁵ education had been documented in surveys such as those by M. F. Paulsen¹¹⁶ or T. McManus.¹¹⁷ Issues such as standardisation have not only been discussed, but have produced initiatives.¹¹⁸ It is opportune for the Faculty to enter the fray as a new era begins, yet be able to base its efforts upon a large body of existing research.¹¹⁹

some of the less admirable machinations of the soft- and hardware industry. Its involvement in educational content and standards, as well as IT criticism, is almost a moral obligation.

115 Since secondary education is an issue for the Faculty, conferring as it does educational qualifications, we must note that not only tertiary education will benefit, as indicated by 3Com's *Troy School Project*: "The Troy School District is deploying an advanced high-speed converged network from 3Com to link together twenty-two sites including nineteen K-through-12 schools with ATM, Gigabit and 10/100 Mbps Ethernet. This solution will include applications such as videoconferencing, streaming video, telephony and shared whiteboard functionality, and will enable teachers in one school to offer classes to other schools in the district. It will also allow teachers and administrators to videoconference with one another in order to discuss new curricula and programs across the district." <<http://www.3com.com/news/releases/nov1998a.html>>

116 <<http://www.nki.no/~morten>> at the NKI institute of distance learning in Oslo. The results of this survey were presented at the ICDE-95 On-line World Conference in Distance Education.

117 Selected Case Studies in Internet Based Post- Secondary Distance Education, University of Texas at Austin, 1995. <<http://rice.edn.deakin.edu.au/Archives/95Annual/1211.htm>>

118 For a discussion on defining standards for online- and distance learning see Miller, Paul, *Abstract from the Standards Fora for Online education* D-Lib Magazine Dec1999, Vol5.No12: "Each of these groups is interested in harmonisation around conventions for knowledge representation based on frameworks similar to or evolving towards the W3C Resource Description Framework (RDF). For interoperability and integration, each is also interested in harmonisation of models for semantics, informed by the requirements of their various constituencies as well as ...the IFLA Functional Requirements for Bibliographic Records".

<<http://www.dlib.org/dlib/december99/12miller.html>>

119 Some educational applications which are springing up relate to the teaching of the new media themselves, such as the Computer Telephony Expo in Autumn of 1999¹¹⁹ at the Jacon K. Javits Convention Center in New

An overview of current developments was provided at the *International Council for Open and Distance Education Conference* in Vienna in June 1999. Themes such as 'new learning environments', 'preserving cultural diversity', 'globalisation of education', 'learner support and structural design,' or the 'technology/pedagogy interface' were forward-looking and instructive. But a discussion of the transition to streaming media usage will only ensue at the 20th ICDE conference in Düsseldorf in 2001, where it is earmarked as a main theme. The conference announcement already emphasises the global significance of new, streaming media education models:

The background for the conference will be the dramatic development in Internet, phone communications, multimedia and computing technologies, which are now being applied to education and training. These developments are dramatically changing our opportunities to learn and distribute education in our different nations, as well as to large audiences across the planet.¹²⁰

A concentrated view of digital education is afforded by the ACO*HUM handbook *Computing in Humanities Education*.¹²¹ Although multimedia are dealt with cursorily when compared to, say, computational linguistics, chapter 2 on *Methods*, edited by Tito Orlandi, contains a discussion of multimedia perspectives,¹²² which indicates that this area's proportions are growing in the larger Humanities IT¹²³ field. ACO*HUM shows that even the young Humanities IT discipline has its traditions and future. Text, linguistics, librarianship are the former, new media the latter.

With its large number of participants, ACO*HUM is an educational initiative which leads the way in Europe.¹²⁴ Several of its projects are listed below. A drawback of an undertaking of its nature, though, is that the protagonists are adherents of technology, whereas an educational issue of this magnitude calls for some debate between advocates and opponents.

One such debate has taken place regarding the virtual university. The virtual university, an outgrowth of Online and Distance Learning (ODL), is already a 'reality' (see the *Jones Cyber University*),¹²⁵ □ and one accompanied by controversy.¹²⁶

York. With seminar themes such as "Customer-centric technology," "IP telephony for the Enterprise" and "NexxNets for Service Providers" the commercial slant of these seminars is obvious.

120 <<http://www.icde.org/News/NewsFra.htm>>

121 de Smedt, K. et al, 1999.

122 Section 2.4.4. Sound and Speech Processing and Multimedia

123 Humanities Information Technology

124 Another of note, covering 23 subjects, is the *Learning and Teaching Support Network*

<<http://www.ilt.ac.uk/ltsn/index.htm>>

125 <www.jonesinternational.edu>

126 The American Association of University Professors' response to JUI is documented at

<<http://www.icde.org/News/NewsFra.htm>>. see also S. Crow's statement at <<http://horizon.unc.edu>>

A leading naysayer is D. Noble.¹²⁷ While many of Noble's arguments are Luddite, some of his points, in particular about fears of vested commercial interests in higher education, are salient. Our opinion, as stated elsewhere, is that the humanities have a role in expressing criticism and counterbalancing forces of commercialism in technology-enhanced education.

The following list enumerates sample projects invoking present-day technology. The list is neither evaluative nor exhaustive; inclusion here indicates solely that a listed initiative would and will benefit from the advantages of technology convergence.

1. Audiovisual services (e.g. at South-western University) with graphics lab, video audio duplication services, media classrooms, off-air recording and satellite downlinks
2. MUD and MOO¹²⁸ resources for interactive discussion groups such as *MediaMOO* at MIT, the University of Geneva's TECFA educational MUD,¹²⁹ or Bergen's CALLMOO for German teaching¹³⁰
3. Web resources for audiovisual speech analysis such as the speech perception and production lab at Queen's University¹³¹
4. IntelliMultimedia projects¹³² for the interpretation of audiovisual content, e.g. at Denmark's Aalborg University
5. Distance and online learning facilities for geographically remote centres of learning such as the online learning services and videoconferencing of the University of Waikato's *Teaching Technology Group*¹³³ or virtual classes of distanced students e.g. University of Amsterdam's electronic course dynamic semantics (ECDS)¹³⁴

¹²⁷ Noble, D. *Digital Diploma Mills, the digitisation of higher education*.

<<http://www.icde.org/News/NewsFra.htm>> On the other hand, Noble and other technology critics using the selfsame technologies they criticise to disseminate their ideas.

¹²⁸ "MUDs used to stand for "Multi-user Dungeons", i.e. multi-user interactive role-playing games on the Internet. Today, the concept "MUD" refers to all primarily text-based Multi-User Dimensions. MUD technology can be used for education in various ways. To connect to a MUD, you can use a telnet client, but better find a specialized Client In education, MOOs (MUD, Object Oriented) are most popular since they have a sophisticated built-in programming language."

¹²⁹ Quoted from TECFA's educational mud page at <<http://tecfa.unige.ch/edu-comp/WWW-VL/eduVR-page.html>>

¹³⁰ <<http://www.hd.uib.no/AcoHum/fh/>>

¹³¹ <<http://pavlov.psyc.queensu.ca/~munhallk/av.html>>

¹³² "IntelliMedia, which involves the computer processing and understanding of perceptual input from speech, text and visual images and reacting to it is much more complex and involves technologies from the Engineering side in terms of spoken language processing, natural language processing, image processing, Computer Science and Artificial Intelligence and from the Humanities side in terms of Linguistics, Cognitive Science, Psychology and studies of the mind..." <<http://www.kom.auc.dk/CPK/MMUI/>>

¹³³ <<http://ttg.its.waikato.ac.nz/index.html>>

¹³⁴ Dekker, Paul *Teaching live on the internet* < <http://turing.wins.uva.nl/~pdekker/> >

6. 'How to' resources for the creation of audiovisual media like the National Technical Information Services' audio-visual transcription services¹³⁵
7. Audiovisual resource collections as exemplified by the University of Texas at Austin¹³⁶
8. Cycles of visual projections and conferences such as the Sala HAL at the Pompeu Fabra University audiovisual complex in Barcelona¹³⁷
9. Specific training combined with a database on audiovisual media and cinema e.g. *Focal*¹³⁸
10. Resources for educational 'updates', by which are meant post-graduate refresher courses for students already in the workplace, like the Public Broadcasting Services' Adult Learning Service¹³⁹
11. Geographically and culturally specific databases of audiovisual materials on a given area subject, say, the Asian Educational Media Service at the University of Illinois¹⁴⁰
12. Classical distance learning such as Britain's Open University¹⁴¹ with its advanced web-based information systems or virtual universities such as Universitat Oberta de Catalunya¹⁴²
13. Creation of resources for audio processing teaching and research: *Matlab* at Sheffield University¹⁴³
14. Web resources for authors of hypertext material which may or may not be enhanced by multimedia content; see the *Kairos* Interactive Site¹⁴⁴
15. An audiovisual prospectus of a faculty and its departments
16. Online instructions for the practical implementation of multiplexed conferencing, distance learning, online lectures and seminars, 'digitale Sprechstunde' and tele-consultation with teaching staff (*SURA* Video Development Initiative)¹⁴⁵
17. Distance learning according to the Fordham model, the ABSALON project at Bergen¹⁴⁶ or GENTLE (telematics and class teaching combined) in Graz.¹⁴⁷

135 <<http://investortranscripts.com/>>: "Audiovisual Transcription specializes in providing transcription services to the investor relations community. AVT also transcribes focus group sessions, interviews, speeches, news broadcasts, and seminars."

136 Described as: The Audio-visual Resources Collection (AVRC) is comprised of over 200,000 slides, a variety of audio visual equipment, as well as audio and video tapes related to architecture, art, landscape and urban planning. The main purpose of the AVRC is to support the teaching needs of the School of Architecture's faculty members and students. <<http://mather.ar.utexas.edu/AV/new-coll.htm>>

137 <http://www.iaa.upf.es/iaa_a.htm>

138 <<http://www.focal.ch/>>

139 <<http://www.pbs.org/als/>>

140 <<http://www.aems.uiuc.edu/index.las>>

141 <www.open.ac.uk>

142 where there is this statement about a multimedia course on Gaudi: "The multimedia course about the Crypt from the Güell colony by Antoni Gaudí is a monographic study in which video, audio, text and image is incorporated.... The different screens, videos, images, audio as well as a virtual tours enclosed ...provide a wider variety of goals than the ones that a normal presential visit could offer. We do not attempt to substitute virtuality [for] presentiality, but take advantage of some multimedia assets in the field of aesthetic analysis with the double aim of easing the learning process and reconfiguring ...learning." Joan Campas & César Carreras: Digital resources and network learning: a course on art history in the UOC.< <http://www.hd.uib.no/AcoHum/fh/>>

143 <<http://www.dcs.shef.ac.uk/~martin/MAD/docs/whatfor.htm>>

144 <http://english.ttu.edu/kairos/2.1/index_f.html>

145 <http://sunsite.utk.edu/video_cookbook>

18. Teaching models using graduate students (UC Berkeley's Multimedia Research Center and Center for Studies in Higher Education)¹⁴⁸
19. Modern history teaching using shared digital archives of streaming video imaged documents.¹⁴⁹
20. Using speech simulation to enhance web translation languages and machine reading of text, such as the Linear Predictive Vocoder project of Klaus Fellbaum¹⁵⁰
21. Planned national infrastructure for networking and content like Internet2¹⁵¹
22. Building communities of humanities scholars via H-Net¹⁵²
23. Using telematics to enhance international gender and women's studies co-operation e.g. the Women's International Electronic University¹⁵³
24. Enhancing language teaching with streaming audio web tutorials¹⁵⁴ or CALL¹⁵⁵ projects such as *Russicon* at St. Petersburg¹⁵⁶
25. Using web-downloadable software and tutorials for teaching speech perception such as Fougeron's *Models of Speech perception* (an Elsnet project)¹⁵⁷
26. Formulation of design principles for multimedia teaching such as the precepts "digital environments are procedural, participatory, spatial and encyclopaedic" by J. Murray at MIT¹⁵⁸

Other Initiatives expressly citing a multimedia¹⁵⁹ concept of education and worthy of note are the ETS Multimedia Resources Unit at Bristol University,¹⁶⁰ the Socrates Multimedia

146 Bente Opheim: Building a virtual university: The importance of the humanities at <<http://www.hd.uib.no/AcoHum/fh/>>

147 "By providing a powerful Web-based classroom Environment GENTLE combines the benefits of distance learning with the advantages of 'learning together' in a traditional classroom. Using GENTLE, learning and training costs may be reduced and valuable information may be easily shared thus supporting a continuous learning process. Courseware creation and re-use is supported by the various wizards, managers and tools that take over routine tasks and provide guidance for more sophisticated undertakings, using helpful user interfaces." <<http://wbt-3.iicm.edu/product>>

148 <<http://ishi.berkeley.edu/>>

149 "A historian has to spend a large proportion of his or her time in archives. This is true for established historians, but it is even more true for students of history, on every level. To be able to widen the scope of history it is important to make archives more easily available....Networks make this possible". <Oldervoll@hi.uib.no> Also see Lee at HCU, <<http://www.hcu.ox.ac.uk/jtap/>>

150 <<http://www.kt.tu-cottbus.de/speech-analysis/>>

151 The university sponsored Internet2 initiative wishes to demonstrate "an enhanced delivery of education and other services by taking advantage of "virtual proximity" created by an advanced communications infrastructure", which translated into normal terms, is a brief for distance education and life-long learning <<http://www.internet2.edu/html/mission.html>>

152 <<http://www.h-net.msu.edu>>

153 <<http://www.wvu.edu/~womensu/>>

154 <<http://wrangler.essex.ac.uk/tn-speech/project/groups/tn-cal/tn-cal.html>>

155 CALL = Computer Aided Language Learning (cf. CAL = Computer Aided Learning)

156 By Serge. A. Yablonsky at <<http://www.russicon.ru>>

157 <http://www.unige.ch/fapse/PSY/persons/frauenfelder/SP/Model_speech.html>

158 <<http://web.mit.edu/jhmurray/www>>

159 It has to be said at this point that Multimedia are often equated solely with the creation of CD-Rom resources. Yet the creation of those resources (with Macromedia *Director* and custom *Lingo* programming) is laborious in relation to the medium's data capacity. The DVD-Rom promises to redress the balance, cf. the new Encyclopaedia Britannica 2000 DVD which contains 15,000 photos and illustrations and more than 5 hours of video. <britannica.co.uk>

module at Staffordshire University,¹⁶¹ the International Multimedia University at Umbria founded by Umberto Sulpasso and co-ordinating with UCLA,¹⁶² the University of Western Australia's Multimedia Centre,¹⁶³ the UCLA Extension - with 105 courses one of the world's largest distance learning projects¹⁶⁴ - or the University of Melbourne, whose vice-chancellor Gilbert has given a resolute statement on the education benefits of 'digital revolution' technology.¹⁶⁵

It is not possible at this early stage to count the main educational products broadband streaming media will turn out from its *global workshop of learning*. Internet will continue to play the main role on the advanced educational stage,¹⁶⁶ but with enhanced features for scholarship which attempt to overcome many of the web's present deficits.¹⁶⁷

Present web technology remains inferior to the past's 'non-interactive' audiovisual resources in terms of image and sound resolution. The telematic industry wrestles with problems of bandwidth. Yet the range and depth of the listed projects, and that of many others which could be added to this table, show that cutting-edge educational research is sparing no effort to set up precursors of new media teaching.¹⁶⁸ Why is the educational community going to these lengths? Why are traditional audiovisual methods not enough?

160 <<http://www.ets.bris.ac.uk/>>

161 <<http://www.soc.staffs.ac.uk/titan/travel/mainmenu.html>>

162 also featured in a keynote address at DRH 98 <<http://www.rocca.net/newsletter/varie/umberto.htm>>

163 <www.arts.uwa.edu.au/MMC/index.html>

164 <<http://www.unex.ucla.edu/index.htm>>

165 Which runs: "The education benefits of 'digital revolution' technology [are] interactive multimedia simulations, animations and data-base analysis that can be linked to online question and answer exercises, with rapid feedback to students and staff. World Wide Web delivery of course materials □ particularly when the delivery style provides interactivity and rapid feedback □ ensures student access is more widely available. It can provide a communication network linking all staff and students in a particular course,.. and with other colleagues and peers overseas." <<http://ultibase.rmit.edu.au/develop/Articles/richi1.html>>

166 Although computer-based, the web's success was not meticulously planned by the IT industry. If anything, it was contrary to the industry's vision of workstation and mainframe functionality filtering down to the PC. We now recognise that internet's mix of computational telecommunication and written *text*, the central object of humanities research, has been the core of its ascendancy: Human-readable code such as HTML or XML admits the richness of language-based communication.

167 In his recent speech on *Next Generation Internet: Empowering the Users* at the Next Generation Internet Policy Workshop, (hosted by the European Commission in Brussels on September 16-17 1999 as discussed in the Massachusetts Institute of Technology *Internet Telephony Committees* website at <www.itel.mit.edu>) J-F. Abramatic a member of the World Wide Web Consortium heralded the coming of *semantic Internet*. Through semantic tagging, XML will allow search engines and research in general to operate with greater precision and depth.

168 De Smedt writes somewhat harshly when he says, "There is a general consensus that university-based studies in typical humanities disciplines, such as linguistics, literature, history, history of art, and philosophy, experience serious difficulties in transferring job-oriented skills to students. A disturbingly low percentage of graduated humanities students is able to find jobs which are explicitly related to their academic knowledge....Many teaching staff in the humanities do not take into account real learner needs and are reluctant to adopt collaborative schemes, communication-centred approaches and the integrated use of the computer in teaching." de Smedt (paper presented at BITE, March 26, 1998), <www.uib.no/acohum>

It is because new and forthcoming audiovisual methods offer, or will offer, interactivity, up-dateable resources, enhanced possibilities of independent student activity, geographical independence, economy of data media, high-speed visual communication with other institutions, internationality, extended source material, efficient and instant linking to audiovisual references, quick responses to student needs for further material, or multiplicity through downloads, as well as techniques whose usefulness go beyond the subject matter itself (viz. telematic and IT-skills) in a way that traditional audiovisual methods cannot.

The strong response in the international humanities IT community to new possibilities is shown by the rich variety of ideas developed. The reasons for this response are evident: new media audio-visuals will increase the means at our disposal to teach and teach well. Through them the Faculty of Humanities will be in a position to augment its time-tried educational principles and traditions.

F: Status of Research: Digital Resources for Humanities

The emphasis in the Digital Education Act proposal cited in *Chapter D*: is on 'content',¹⁶⁹ and the international humanities community, or rather a segment of it, has undertaken many steps to create digital content for various disciplines. Digital content is subsumed under the title *digital resources*. An overview of international activities in the field continues to be given at state-of-the-art conferences such as the *Future of the Humanities in the Digital Age* or *Digital Resources for Humanities* (DRH) held in 1999 at Kings College London.

The spirit of DRH is inter-disciplinary, and as such offers the humanities scholar depth *and* breadth. So too, the showcased technologies and projects. In 1999 more 'traditional' digitisation themes were the HTML *Faulkner*,¹⁷⁰ the *Prosopography of the Byzantine Empire*,¹⁷¹ the online edition of the *Oxford English Dictionary*¹⁷² or digital imaging (Bergen's *Wittgenstein Nachlass*).¹⁷³ Neo-text issues came up in discussions on TEI-XML, inspired by Michael Sperberg-McQueen's seminal paper "*What is XML and why should Humanists Care?*"¹⁷⁴

169 "The availability of high-quality digital content is central to research and teaching developments in the arts and humanities over the coming years" Dr. Maria Economou, at the Humanities Advanced Technology and Information Institute <<http://www.hatii.arts.gla.ac.uk/Courses/digitisation/>>

170 "It has long been recognised that Faulkner wished to publish *The Sound and The Fury* using different coloured inks for the time and event sequences in the Benjy section of the novel." Thomas Porter, University of Alaska <ftap2@uaf.edu>

171 <<http://www.kcl.ac.uk/humanities/cch/PBE/TechDetail.htm>>

172 <<http://oed.com>>

173 <<http://www.oup.co.uk>> ISBN/0-19-268243-1

174 <<http://users.ox.ac.uk/~drh97/papers/Sperberg>>

These are essentially text-orientated themes. Nonetheless, streaming media projects are beginning to make inroads into the DRH world. Subjects were *The British Library's Digital Audio Resources*,¹⁷⁵ *Accessing the Moving Image in the Digital age* through *Cinemia's Swift*, the *Combination of Context and Contents Description in Multimedia Archives*, an MPEG7¹⁷⁶ project at the Universidade do Porto,¹⁷⁷ or PATRON's digital library for the Arts,¹⁷⁸ to name but four. Virtual spatial representation were embodied by the *Chatsworth House* project¹⁷⁹ and efforts at expert systems CD- Roms were numerous in the publishing world.¹⁸⁰ Notable, too were online projects utilising multimedia by DRH luminaries such as Stuart Lee's *Wilfried Owen Multimedia Digital Archive* website at Oxford University.¹⁸¹

Content is the key to hypertext, and that holds true for nextgen resources too. A large faculty can be regarded as a *major content provider*, to use new media jargon. As latest tendencies at the major conferences indicate, streaming media on their way to enhancing the ability of the digital resource community at the Faculty of Humanities to disseminate its thinking, its studies and the *materials* it creates. In readying ourselves to prepare content, we demonstrate the preparedness of the University to take heed of current research tendencies and marry its profound humanist tradition to newest methods for creating those very materials.

G: Bandwidth and the Timetable of Developments

The timetable for the introduction of high-bandwidth telematics is not measured in decades, but in months. Already in 2002, satellite-enabled¹⁸² UMTS will be introduced in Europe. ATM is a reality, as we write. The expansion of global

175 <<http://www.bl.uk/>>

176 MPEG (Moving Picture Experts Group) is a ISO/IEC working group developing international standards for compression, decompression, and representation of moving pictures and audio. "Lots of audiovisual information is available on the web, but there are not adequate search tools to locate this information. The aim of MPEG-7 is to specify a set of descriptors to describe various forms of multimedia. It will also standardize ways to define other descriptors as well as structures for the descriptors and their relationship. This information will be associated with the content to allow fast and efficient search." <<http://www.cis.ohio-state.edu/~jain/>>

177 further information can be obtained from Dr. Susana Gaio at <sgaio@fe.up.pt>

178 under Jon Maslin at the University of Surrey.

179 created by Nigel Williamson of Sheffield University, <N.P.Williamson@shef.ac.uk>

180 Many resources depart from traditional models, not only through digitisation but in content, such as the Multilingua *Movietalk* resources of Systema in Frankfurt <www.systema.de> where language teaching is done using excerpts from TV series. Expert systems can be used to construct contracts, such as Vlasaty's *Multimedia Verträge und Lizenzen*.¹⁸⁰

181 <<http://www.hcu.ox.ac.uk/jtap/>>

182 <<http://www.ee.surrey.ac.uk/Personal/L.Wood/constellations/overview.html>> gives an overview of the satellite issues.

backbone capacity¹⁸³ to carry high-bandwidth content will of course be piecemeal. But it has been planned years ahead, as exemplified by TERENA's wavelength workshop on Gigabit Networks in Europe,¹⁸⁴ CA*3NET (Canada's 40 Gigabit/s network), the Internet2 initiative¹⁸⁵ and protocols such as Ipv6 (Internet protocol version 6) or RTP.¹⁸⁶

Beyond this, backbone providers are extending high-throughput technology such as DWDM¹⁸⁷ with exotic proposals for open air photonics.¹⁸⁸ Agencies such as the NGI, the NextGen Internet Initiative,¹⁸⁹ discuss testbeds for education that are one thousand times faster,¹⁹⁰ than today's internet. ¹⁹¹ Bell Labs scientists have successfully transmitted 37 *terabits* (trillion bits) of information per second using 1000

183 Definition of *backbone*: "High-speed networks that carry Internet traffic. These communications networks are provided by companies such as AT&T, GTE, IBM, MCI, Netcom, Sprint, UUNET and consist of high-speed links in the T1, T3, OC1 and OC3 ranges. The backbones carry Internet traffic around the world and meet at Network Access Points (NAPs). Internet Service Providers (ISPs) connect either directly to a backbone, or they connect to a larger ISP with a connection to a backbone. The topology of the "backbone" and its interconnections may once have resembled a spine with ribs connected along its length but is now almost certainly more like a fishing net wrapped around the world with many circular

paths.<<http://wombat.doc.ic.ac.uk/foldoc/foldoc.cgi?Internet+backbone>>

184 <<http://www.terena.nl/tech/wave-workshop/mtg991122.html>>

185 quoted from the FAQ at <www.internet2.edu> " Just as today's Internet arose from the academic and federal research networks of the 1980's, Internet2 is helping to develop and test new technologies, such as IPv6, multicasting, and quality of service (QoS), that will enable a new generation of Internet applications....University research and education missions increasingly require the collaboration of personnel and hardware located at campuses throughout the country. These are exactly the types of tasks that are not possible on today's Internet and which need the technologies Internet2 seeks to create."

186 Real Time Protocol. For a FAQ see <<http://www.cs.columbia.edu/~hgs/rtp/faq.html>>

187 "A key factor driving this revolution is dense wavelength division multiplexing (DWDM), which delivers the bandwidth necessary to generate the vast array of voice, video and data services that end users expect from their service providers. These are technologies for optical transmission, even to the point of open air photonics." See <<http://www.telecommagazine.com/issues/199910/tcs/free.html>>

188 One never knows whether these proposals are made to herald a coming technology or to attract shareholders.

189 <<http://www.ngi.gov/sc99/about.htm>> a multi-agency Federal research and development (R&D) program that is developing advanced networking technologies, developing revolutionary applications that require advanced networking, and demonstrating these capabilities on testbeds that are 100 to 1,000 times faster end-to-end than today's Internet.

190 *QuickTime*, Real Network's *Real Video*, [Intel *Indeo*] Microsoft's *WindowsMedia*, plug-ins for low bandwidth systems, move surely towards streaming: "The Internet and slow access is pushing the industry to provide a solution that will enable people to start viewing data before the entire file has been received... Multimedia files are getting larger, so the need not to wait for a large file to be downloaded is important..." Dolan, J. et al in<<http://mason.gmu.edu>> Adventurous *non-plug in* solutions such as Geo's *Emblaze* decode the stream using a Java applet send ahead of the content, with dynamically scalable file formats. *Prime Learning* uses *Emblaze* technology in its e-learning solutions. (GEO web site, press release 19.10.99).

191 These software compression efforts are reminiscent of music sampling technology in the mid-Eighties, where due to RAM (random access memory) costs and limitations, the main efforts were expended on compressing audio data. Later, as RAM became plentiful, the efforts turned to the sound themselves, i.e. content came to take precedence over compression.

different wavelengths □ or colours □ of light, each carrying nearly 40 gigabits per second.¹⁹²

But bandwidth is not the whole picture. Hardware moves forward, with 0.15 micron, one gigaflop CPUs,¹⁹³ 256-bit graphics¹⁹⁴ and 80MByte/s hard disc throughput¹⁹⁵ for AV-editing already commonplace. Demand for IP-multicasting¹⁹⁶ grows and packages for low-cost streaming are a reality.¹⁹⁷ Software developers address needs for content delivery networks, spoken language computing,¹⁹⁸ audiovisual archiving, as in ScreenSound's modular program MAVIS,¹⁹⁹ and many other fields. There is research in more effective data compression, such as wavelet imaging, with JPEG 2000 earmarked for introduction in 2001.²⁰⁰ Real-time systems,²⁰¹ and AI search engines²⁰² are just two of computing science's myriad topics. Cutting edge multimedia research is presented at the annual ECMAST meeting, on themes like IP, MHEG-5, 3D imaging, encryption and interoperability.²⁰³

The promise of technology convergence, high-bandwidth streaming and third generation telecommunications by 2002 or 2003 is real, and explains the timing of the present study. At its conclusion, the Faculty will be primed and ready for the

192 "They used both dense wave division multiplexing (DWDM), a technology that combines multiple wavelengths on a single fibre, and distributed Raman amplification, a technique that allows optical fiber to amplify the signals travelling through it." See Petra Percher *Drahtlose Netze* in: *Die Presse* 19.1.2000, page 21. Or <<http://www.lucent.com/press/0699/990607.bla.html>>

193 "The MPC7400 processor [called by Apple 'G4'] uses a parallel-processing model called SIMD, Single Instruction-Multiple Data. While conventional processors generally execute one to three instructions per clock cycle, Motorola's MPC7400 with AltiVec technology can execute a record 20 operations per clock cycle, thereby rendering processor comparisons on clock speeds (MHz) virtually useless. The MPC7400 PowerPC microprocessor is the first of Motorola's microprocessors to be manufactured with the new .15-micron copper HiPerMOS fabrication process. The use of copper in place of aluminum improves circuit speeds and reliability, and reduces manufacturing costs." <<http://www.motorola.com/SPS/PowerPC/AltiVec/news.html>>

194 "Continuing to raise the graphics performance bar, NVIDIA™ Corporation (NASDAQ: NVDA) today announced that the GeForce 256™ and NVIDIA Quadro™ graphics processing units (GPU) are the first 3D processors to fully support the new Intel® new 820 chipset. ...The GeForce 256 and Quadro GPUs are the only graphics processors to support both AGP 4X and Fast Writes." <<http://www.nvidia.com/products.nsf.>>

195 Wide Ultra2 LVD SCSI (small computer system interface) has a throughput of 80MB/s compared with SCSI 1's 5 MB/s.

196 <<http://www.ietf.org/html.charters/mboned-charter.html>>

197 Like the Apple open standard *Darwin* Streaming Server, which works via RTP and RTPS.

198 <<http://www.sls.lcs.mit.edu/sls/whatwedo/index.html>>

199 The system is in planning for use by the Austrian Film Archiv.

<http://www.screenound.gov.au/services/frame_services.htm>

200 <<http://dogma.net/DataCompression/JPEG2000.shtml>> Nolan's is a good site for all compression issues.

201 Advances in the science of real-time computing are documented by the Technical Committee on Real Time Systems of the IEEE. For further information see the real-time research repository of the Institute of Electrical and Electronics Engineers at <<http://cs-www.bu.edu/pub/ieee-rts/>>

202 <http://www.ac.com/services/cstar/cstar_projects.html>

203 For an overview of the ECMAST conference in 1999 in Madrid see the deliverable <<http://www.prime.iao.fhg.de/prime/deliverables/d205b1.PDF>>

introduction of new media. It will not merely react to developments which have taken place, but will have anticipated them and evaluated their fruitfulness for its own didactic agenda.

H: Teaching Digitisation and Creating Resources with Humanities Students

Those members of staff who are enthusiastic about the possibilities of new methods, and those include the author, know that there is a vast gap between the stratospheric heights of the *technology convergence, new media or third generation telecommunications issues* facing the University, as well as various high-level ideological and philosophical debates, and the down-to-earth reality of a class of humanities students □ or even teachers □ who are curious, yet unsure what the word *digital* even means.

This chapter examines briefly the practical reality of teaching technology to humanists, something the author has practised for ten years.

The author's teaching approach is a threefold 'CPC' approach: **Content-Practise-Concepts**. *Content* is easiest to teach, since it draws upon students' humanities training, and may serve to show how well students have grasped humanities content itself.²⁰⁴ *Practise* is also clear to most students, as long as learning curves are not steep and step-by-step instruction is given. This kind of teaching should not be weighted too heavily towards the use of a specific application.²⁰⁵ Most difficult is the *Concepts* part, explaining why we go to the lengths of digitising and data-processing materials and what the link is to humanities and the real world.²⁰⁶

²⁰⁴ Practical advice on this point is given by Carmel McNaught at LaTrobe University Melbourne: "Too often multimedia is thought of as being something that teachers produce in order to enhance their teaching. It is more useful to consider it as a strategy to use in designing activities for students to enhance their learning."

"... Select a simple presentation or authoring package such as *PowerPoint* or *HyperStudio* (both of these are cross platform). Students then prepare and present their seminars using one of these tools. You do need to give some thought to what sources of visual material might be useful for students to access. The Web is an obvious resource. Digitising slides already in your department is another; this can be done quite inexpensively through commercial avenues such as Kodak now."

"The way in which students put their presentations together often gives staff a clear idea about the strengths and weaknesses of students' knowledge in the area....." <<http://ultibase.rmit.edu.au/Archives/mcnaul.html>>

²⁰⁵ "For all practical purposes, most public discussion has focussed on the first level, humanities computer literacy. ...Not surprisingly, the short life span of such courses creates the feeling that no progress is being made. The decision of a German university to accept a course titled *Computer Science for German Studies: WordStar 2000* in the eighties, damaged the credibility of the humanities department concerned at the computer science department. More significantly, the short half life of any such application-based course implies an equally short-term usefulness."

²⁰⁶ As ACO*HUM authors state, "...courses [in computer literacy] often deal with the technical side of computing and miss the special symbiosis created between computing procedures and humanities methodology. (Chapter 2.2.3)...the problems of communication between 'pure' technicians and content-interested humanities students which, time and again, tend to dominate any discussion" (Chapter 2.3.2).

An example of *concept* teaching is the following introductory lesson on digitisation and data. This text, which the author developed for teaching EDP- and MIDI-technology²⁰⁷ to Upper Austrian secondary school teachers at his seminars in *Schloss Weindorf* is illustrative of a method that has been successful in overcoming innate 'technophobia' among humanities students and teachers: [the lesson text is contained in Appendix 1].

The **four point** scheme behind the material is:

1. To consistently use language which is not only abstract and self-referential, but is vivid and conveys knowledge *by analogies* relevant to a humanities student. The analogies and the 'digital information' are sandwiched, each section being reasonably short.
2. To selectively filter technical information before the lesson, focussing technical language and abbreviations on an initial term. The chosen term then leads into broader discussion and related information (in the above example *A/D converter* which leads to *sampling frequencies, bit depth, file sizes, compression, new formats [Super Audio Disc] etc*), that may also be supported by an everyday technology.
3. To teach audiovisual methods by *demonstrating* them, which can only happen in a room where the equipment is present and functional, and demonstration materials are prepared beforehand (DSP functions illustrated on DAT, presentations via LCD projectors²⁰⁸ etc.)
4. To allow student's to 'discover' humanities information in the material (in the above example Mozart's death in 1791, the French proclamation of the Republic in September 1792, the introduction of steam-driven production to Germany by C.F.Bernhard in 1795), allowing them to invoke their own training and interests.

Regarding resource creation, we have to differentiate between programs that students can realistically be expected to learn, master and even own, such as *PowerPoint*, and high-end systems such as *Media 100* or *Pro Tools*. With the former, goals must be clear and academically relevant, such as CD-Rom video illustrating a linguistic analysis of advertising texts.²⁰⁹ Key command or mouse practise in class makes the student feel he/she has attained *initial competence* with the software, breaking down inhibitions. The instructor must insist on the students writing down key commands for later use. Subsequent resource creation can be done by the

²⁰⁷ Musical Instrument Digital Interface. This single byte interface for communication between synthesisers and sequencer programmes was introduced by Dave Smith of Sequential Circuits in 1984. Although criticised for being a serial interface, with attendant problems of latency and timing, it is still one of the format success stories because of its global hegemony.

²⁰⁸ Projectors can be LCD (Liquid Crystal Display) and DLP (Digital Light Processing, a Texas Instruments technology (see: <<http://www.ti.com/dlp/technology/howitworks/index.shtml>>). LCD projectors are being constructed now with light intensities of up to 4,000 ANSI lumen (Sanyo) or with auto pixel alignment and 3D gamma correction (Sony's XGA resolution VPL X2000). Practically speaking, it is important for screen and projector resolution to match.

²⁰⁹ See Margl, E. *Dichotomien bei der Werbung oder im Internet*, Diplomarbeit, Vienna, Feb2000.

student at home. As long as goals are clear, the student will be inspired to 'work through' the software.²¹⁰ Formats such as Microsoft's ASF, Advanced Streaming Format,²¹¹ new versions of plug-ins like G2²¹² or *Quicktime*,²¹³ streaming capable video compression as in Intel's *Indeo*²¹⁴ and the XML standard SMIL²¹⁵ will figure prominently here.

On the professional side, the author has created digital audio productions with DSP²¹⁶ treatments, sampling²¹⁷ and MIDI treatments with students at the University of Vienna that have been broadcast internationally in six leading German-speaking radio stations, including an ISDN interview with our Viennese students on Switzerland's DRS.²¹⁸

When teaching high-end systems, complexity is necessary for the *instructor*, but not for the *student*. It is necessary to give the students just enough information to let them do group work on a resource.²¹⁹ Professional software work is purely a class activity. Students may watch expert usage of a soft- or hardware system, but their attention spans will be limited. Again they must write down basic commands, and leave the seminar with an understanding of what the system does and why. The final phase of work on the resource should be done *alone* by the instructor, to speed up production and let him or her bring production experience to bear without interruption.

210 Some of the author's mottoes for students: 'Ideas first, machines third. The idea is in your mind, then on paper, then in a computer. When making a resource, first switch the computer off.'

211 ASF builds upon existing Microsoft standards such as WAV and AVI.

<<http://www.microsoft.com/asf/specs.htm>> It is the Windows *Media Player's* output format. For a comparison of the player, which also uses MPEG 4 compression, with Real System's G2 see

<<http://www.microsoft.com/windows/windowsmedia/en/compare/g2comp.asp>>

212 <<http://www.realnworks.com/index.html>>

213 QuickTime, Apple's plug-in for audio visual content, supports all major formats and even has a streaming TV selection of over 25 channels, see <<http://www.apple.com/quicktime/qttv/>> There are also other early adaptors such as Vivo (VideoNow) whose future seems less certain;

<<http://www.vivo.com/>>.

214 "The Indeo audio codec is included with the Indeo video 5 codec and Progressive Download filter. Movies containing compressed Indeo video 5 and Indeo audio streams are created using Intel's Indeo video 5 Progressive Download Publisher tool." <<http://developer.intel.com/ial/indeo/video/index.htm>>

215 SMIL (Synchronised Multimedia Integration Language), already worked out as *Boston SMIL* in Summer of 1999 and planned for inclusion in the XML recommendations in June 2000.

216 Digital Signal processors. For precise documentation on these chips at the heart of streaming, digital audio and telephony, see the CR-Rom resource *Motorola DSP technical Documentation 3Q*, available from the manufacturer.

217 Sampling is a technology of RAM-based digital sound recording and alterable pitch playback from a MIDI keyboard. The author has practised this technology since 1984 (with a commissioned performance at Ars Electronica, Linz) and today has over 300MB of sampling RAM. Modern samplers usually have synthesis and sound-altering DSP functions on board.

218 For more information on the author's production of digitised content and resources, see appendix 3.

219 Those students who wish to know more can be told where to find the information, particularly on the web. Students who are more knowledgeable should be allowed to explain concepts to the rest of the group (with help), so they are not held back.

I: New Media as an Object of Humanities Research

The implications of information technology for humanities departments whose subject matter is being *formed* in our age, such as modern history, history of art, musicology, anthropology, literature and so forth are already inescapable.²²⁰ We are being invited as humanists to comment upon “technology-driven culture” itself, to quote a term by D. N. Rodowick.²²¹ The creative object is not only on paper, canvas or score but in hypertext, bitmap and audio file. Members of the humanities community have responded. Some, like De Smedt, have called for changes in our critical methods.²²² Others, like Allen Renear, have pointed to the speed of developments.²²³ Some universities have even gone to the extent of putting media content online in LANs.²²⁴

But computers have increased the quantity, not the quality of creative work. The main problem for Faculty members wishing to investigate these topics is not finding critical tools □ they are in a position to develop these themselves □ but finding material worthy of research. In order to be aware of what is available (while not ignoring comment on technology-driven education, such as Nyíri’s *Towards a*

220 The advent of the digital revolution - specifically the Internet - apparently confirms both Jean Luc Godard's belief in the "end of cinema" and other critics' claims that we have entered a "post-television age"... Moreover, the recent arrival of the laser disk, CD-ROM, DVD and virtual reality imagining systems present even more formidable challenges ...to film studies' pedagogical methodologies. ..The field of cinema and TV studies must re-invent itself and confront some of its primary assumptions. My concept of "digitextuality" is one means of theorising, analysing and teaching this transformed media landscape currently being described as the "convergence industries." Everett, A. *Digitextuality: Cinema Studies in the Age of Digital Reproduction* UC Santa Barbara, quoted from the *Media in Transition* conference at MIT, 1999. <http://media-in-transition.mit.edu/conferences/m-i-t/index_summaries.html>

221 <<http://www.rochester.edu/College/FS/Publications/AVCulture/1AVCHome.html>>:

“In 1991 I published an essay in *Camera Obscura* entitled "Reading the Figural" where I developed concepts for representation... and the organisation of collectivities in time and space [that] were changing with the ascent of digital communication. [In 1988], the technologies I referred to □ for example, digitised video or electronic publishing on the Internet □ were not commercially available ...or were not widely used in the humanities. Now they all are. This [shows] the speed of technological change that today confronts ...educational media.”

222 “An adaptation ...of our old rhetoric and iconic theories is badly needed to study creative and cultural expressions using new technologies, such as computer games, non-linear hyperliterature, computer music, and various new hybrid art forms including interactive sculptures, or even bio□electronics.” de Smedt, in *Computing in Humanities Education*, 1999, ch 1, 1.1

223 “[There is] a striking ...recent phenomenon: the very rapid development of centers and programs for the study of New Media or Digital Media. These centers focus on digital media and culture in particular rather than cultural products in general, [enforce] a relative de-emphasis of traditional disciplinary methodologies from the humanities, and [incorporate] production as a fundamental aspect of their work.” in: ACH Panel: Humanities Computing and the Rise of New Media Centers: Synergy or Disjunction from <<http://www.iath.virginia.edu/ach-allc.99/proceedings/renear-ach.html>>.

224 Hardware delivery of new media at the intranet or virtual LAN (local Area Network) level is already in operation at Georgia State University with *Cineon*.

Philosophy of Virtual Education)²²⁵ we have to be on the watch for significance.

Showrooms may be conferences, such as the *Harvard Conference on Internet and Society*,²²⁶ or web resources themselves.

Students of contemporary culture seeking sites deemed worthy of comment by leading scholars, can, for example, browse the *hygrid* collaborative art project,²²⁷ the *telepolis* magazine of net culture²²⁸ and the interactive fiction page,²²⁹ all three recommended by Hrachovec, or the more graphic-historical *Saul Bass* website, quoted by Willard McCarthy in a *Humanist* discussion on new media.²³⁰ Other 'official' web culture examples might be the *BBC World* website's *HARDtalk* page,²³¹ notably its June 1999 interview with playwright Harold Pinter, or the *NMPFT*,²³² whereas 'underground' examples might be the *ice* homepage and its *demo-scene* graphics,²³³ the *Unmax* page for MAX music software²³⁴ or, to quote an audiovisual example, any one of the weekly digital art clips at *The New Venue*,²³⁵ such as Krista Prestek's *Cosmo Tells All*.

Prestek's work brings us to the question of comment on internet art and society provided by exponents of gender and womens' studies, who have developed theories under the heading of *cyberfeminism*.²³⁶ The Interuniversity Co-ordination Centre for Gender Studies led by Dr. Ingvild Birkhan publishes a handbook which deals with women's studies lectures and also lists web resources on related themes.

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225 Nyíri, Christoph *Towards a Philosophy of Virtual Education* in Digital Resources for the Humanities Conference Handbook, Kings College, London, 1999, page 124.

226 For an overview of the conference see the highly commendable website with streaming content at <<http://cybercon98.harvard.edu/asp/splash.asp>>

227 <<http://www.sito.org/synergy/hygrid/>>

228 <<http://www.heise.de/tp/>>

229 <<http://www.cs.cmu.edu/afs/cs.cmu.edu/user/wsr/Web/IF/homepage.html>>

230 <<http://www.saulbass.co.uk/>>

231 <<http://www.bbc.co.uk/worldservice/index.shtml>>

232 <<http://www.nmpft.org/home.asp>>

233 The *ice* homepage describes the somewhat dubious, but culturally indicative activities of the so-called *demo scene*, programmers and graphic designers who emerged from the Amiga computer community. They program in assembler thus circumventing restrictions in Windows. They are responsible for *Sonique*, the unusual-looking MP3 player, which deviates ingeniously from the appearance of a normal Windows program. (<<http://music.sonique.com>> Some of their graphic work, and their sub-culture, seems worthy of comment (<<http://www.ice.org/>>).

234 <<http://www.node.net/MAX/main.html>>

235 <<http://www.newvenue.com/>>

236 <<http://www.obn.org/kassel/index.html>> is one web site dealing in a graphically pleasing manner with the subject of Cyberfeminism. "Cyber and Feminism - two terms coined through recent history, ideology and evangelism. What happens when these two words collide? Cyberfeminism is a new and promising term. It suggests a fresh ideology, embracing the notions of "cyber" and "feminism" and all they signify. It creates a space for women to invent, dissect and alter the trajectories of the new technology and information"

237 Kral, A., Pohn-Weidinger M., Schindler, L. *Frauenforscherin: We Can do It*, Interuniversitäre Koordinationstelle für Frauenforschung, Wien 1999. 71 pages. See, too,

Those Faculty members who are interested in this discussion should have access to relevant material, this being a declared aim of our proposal for a library of resources.²³⁸ A repository of such resources would also have to co-ordinate with Faculty and Faculty-near experts such as Hrachovec, Ritt, Deutsch, Gruber et al. with requests for weblists and recommendations.

All things point to new media not merely being used as additions to the Faculty tool-chest, but as objects of enquiry themselves, analogous to archaeological finds or 15th century manuscripts. Those few that are best can aspire to be humanist documents of their time, furnishing material for the ongoing humanities debate as have the intellectual and spiritual products of the past.

J: Perspectives for the AV-Zentrum

With considerable foresight, members of the Faculty of Humanities and *ZID*, amongst them Dr. Spann²³⁹ and Dr. Steinringer,²⁴⁰ made provision for an audiovisual centre in their planning for the new AKH campus.²⁴¹ Practical work at the centre would probably consist of tasks such as

- pooling skills derived from classical audiovisual production methods, including high-end audio recording, camera work, audio editing, sound design and video editing
- practising software skills relating to the languages and protocols of streaming media use
- setting up and maintain a streaming server
- bringing in professional audio and video production equipment, to be used in the course of streaming media educational research
- preparing the centre for video conferencing and distance learning use
- producing pilot content which positively reflects the activities of the Faculty and transports the information its members intend to convey within and beyond the University

The abilities and facilities the Faculty will need for the creation and use of streaming media content will be analogous to graphic and text skills in today's internet. Recognisably, the creation of high quality websites is dependent on a

<<http://www.univie.ac.at/Frauenforschung/>> which documents *Fifth Framework* activities, the Womens International Electronic University, <<http://www.wvu.edu/~womensu/>> or the *The Shaping the Network Society* Conference <<http://www.scn.org/cpsr/diac-00/>>

²³⁸ in chapter B of this paper.

²³⁹ Dr. Spann lectures at the Department of Modern History.

²⁴⁰ Dr. Hermann Steinringer is the Head of Networking at the University of Vienna's Centre for Information Services (ZID), and is already actively using video-conferencing on a day-to-day basis for intra-university communication.

²⁴¹ The Faculty of Humanities has changed its location from the New Institute Building (NIG) to the former Old General Hospital (AKH), a campus site in the heart of Vienna. Some Institutes such as History, German and Classical Philology continue to be housed in the main university building on the Ringstrasse.

profound understanding of HTML, XML, Java, ASP, CGI, PHP3 etc.²⁴² but also on a classical command of graphical design and the composition of succinct texts. A good example of this is Holland's design of its *Open University Webpage*.²⁴³ Good design²⁴⁴ carries at least the promise of good content. That surely holds true for the audiovisual sphere.

The audiovisual centre will be a technical facility for the Faculty but more than this, a place of learning and inquiry, run by humanists for humanists. It can only fulfil its functions if it is constantly aware of its central *aim*: to promote humanist teaching and scholarship. Many of those who will use the facility will not be experts, and they have to be treated with the understanding that we, as teachers, bring to the uninitiated. Technology will play a major role, but always one supportive of content.

In conclusion, the proposed period of research will serve to gather, analyse and provide information on an audiovisual concept for a large Faculty with emphasis on didactics. This research is necessitated by an imminent revolution in the methods by which knowledge is disseminated. It is due to change classical audiovisual means and today's educational telematics out of recognition.

The key players in the coming revolution, which, unlike many of the manufacturing, cultural and economic thrusts of the last thirty years, originated in the research and academic community, will be the university, competing strongly with entertainment and e-commerce. The educational world already has a clutch of new termini – life-long learning, distance and online education, virtual re-unification, computer mediated communication,²⁴⁵ instructional management systems, MUDs

²⁴² For a PHP manual (personal home page scripting) see <<http://xpc2.ihep.ac.cn/php3/manual.html>>
Pedagogic literature which the author can recommend on the other subjects is:

Ladd, E., O'Donnell et al. *Using HTML 4, XML and Java 1.2*, Que, 1999, 1,282 pages. Also includes PDF versions of related literature such as *Using ASP* and software. **Weinman**, L. *Designing web Graphics*, 3rd edition, Indianapolis, new Riders, 1999, 445 pages. Has a very good section on browser safe colours. **Cadenhead** R. and Lemay, L. *Java 2 in 21 days* Indianapolis, Sams, 1999, 673 pages. Not only an introduction to Java programming (best in combination with Microsoft's Visual J++) but is well nigh a manual on the subject of technology education, through Lamay's teaching techniques. **Colburn**, R. *Sams CGI*, Indianapolis, Sams, 1998. 387 pages. Perhaps not the very latest information, but has an overview of Perl, the language devised by Larry Wall and commonly used in Common Gateway Interface, and CGI C++ programming. **Anderson**, R., Homer, A. and Robinson, S. *Components for ASP*, Birmingham, Wrox Press, 1999, 831 pages. Written from programmer to programmer in a concise style. **Goldfarb**, C. Prescod, P. *The XML Handbook*, Prentice Hall, New Jersey, 1998. An overview written by the author of SGML, including case studies and XML guidelines, as well as useful software.

²⁴³ At <<http://www.ouh.nl/dhtml.htm>>.

²⁴⁴ For an effective demonstration of web graphics see *depend* at <<http://www.depend.co.uk/findex.html>> or Smolenski at <<http://www.smolenski.com/>>

²⁴⁵ <<http://info.ox.ac.uk/jtap/reports/teaching/index.html>>

and MOOs, educational updates and many more. These will be added to in profusion.

Optimism is often misplaced. But one thing is certain –streaming is due to affect higher education as a whole. In establishing itself in that field now and not later, the Faculty of Humanities at Vienna University will secure its place in the vanguard, defining itself as a institution ready to engage in new media-assisted higher education in the nascent century.

APPENDIX 1

From main text, page 9

Introduction to Digitisation and Data Concepts:

LESSON TEXT

“Imagine we are confectioners [Zuckerbäcker] in Vienna. We have just invented a new cake, the *Mozarttorte*. We wish to send the cake to Hamburg, where we think it might be in demand, so we hire a messenger. The trouble is, this is not the year 2000, it is Summer 1792 and there is no cold transport. When the messenger arrives in Hamburg the cake is ruined. What do we do?”

[At this point the class is silent for a few minutes until someone realises the answer and calls out “Send a recipe!”] [ein Rezept]

“Good. The messenger sets off faster, not slowed down by the cake. But when he arrives the recipe is torn, crumpled and stained with wine. The baker can’t read, but gives it to his assistant. He can only barely read it with glasses, but it suffices for him to turn out a full *Mozarttorte*. Hamburg writes back: ‘Too sweet’. We reply: ‘Sugar not 250g, 200g’. Then they copy the recipe, each copy being used to produce a perfect cake. They add the word *cherries* to the recipe, and in September multiply the ingredients to make a giant cake for a celebration by twenty-one French tourists.”

“The *Mozarttorte* recipe explains the principles of digitisation. Digitising audio, video, text or images means making numerical descriptions of them and instructions on how to recreate them, like recipes. We may use *analog/digital A/D and D/A converters* for this. Digital data are physically small and easily transported at high speed. They may be less perishable or unavailable than the object they describe. They are insensitive to degradation as long as they can be just read. They make perfect copies and copies can be changed to make new versions. Data are written in short, unornamented messages. Data can be improved (the ‘sugar update’) and we need special equipment to read them”.

“The story has an unhappy ending. In 1795 Herr Bernhard, the baker’s assistant, imports a steam machine to mix hundreds of cakes, changes the name to ‘Mozart Cake Hamburg’, pretends *he* invented it and sells it to America, where it becomes hugely popular. He dies rich, we live in poverty.”

“This teaches us that machine processing is faster than human labour, data are global, copyright is important and a few people become very rich selling software.”

APPENDIX 2**Dr. Stephen Ferguson EQUIPMENT LIST****Dynamics**

Amek Neve 9098 Class A Preamplifier and EQ
von Rupert Neve 2 units

Tube Tech valve compressor CL1B Lydkraft

Aphex Dominator II, Multiband Peak Limiter 720

Symetrix Quad Expander Gate 564e

BSS DPR 402 Stereo Compressor
Peak Limiter De-Esser

DBX 160 Mono Compressor/Limiter

Chilton CM2 Broadcast mixing
console,
to a design by Paul Reps for the BBC London

Yamaha ProMix 01V Submixer with 20bit AD convertors,
and digital input card

Patchbay balanced, Neutrik plugs, Gotham cable

Korg DTR1 19" digital tuner

Ultracurve Realtime Analyser

Edison phase correlation meter

Mackie keyboard mixer 16 Channel CR1604

Microphones

Neumann TLM 170 condenser studio microphone

AKG C456 microphones 2 units

Shure C456

Effect processors

Eventide Model H3000 D/SE UltraHarmonizer

Lexicon Nuverb reverb with stereo imaging,
functionally identical with Lexicon
300

Lexicon PCM81 AES/EBU multi effect processor

Yamaha SPX 990 multi effect
processor

Yamaha REV7 digital reverberator

Yamaha SPX90 12 bit digital effect processor

Sony DPS-R7 reverberator

DBX 120 XP subharmonic Synthesiser

Behringer Ultrafex Denoiser

Recording , Digital editing

Pro Tools 4, 888 Interface, TDM Karte
DSP Karte and Software

Digidesign Adat
Interface

Power Mac 8100, 128MB Ram, triple SCSI
controller, Seagate Barracuda, Quantum Atlas
7GByte
Miro 21" TOC 95
monitor

Yamaha CD writer, Jaz Drive, Jaz Catridges

Logic Audio Platinum

Opcode Vision

Waves Bundle Plug Ins

Sound Designer II

Steinberg Recycle, Norton Utilities, Hearnmaster

Notator

Score (DOS notation program developed at Stanford)

ADAT Multitrack recorders

3 units

ADAT BRC Remote Controller

MIDI and Sounddesign Hard- und Software

MOTU Midi Time Piece, 2 units

AKAI S5000 Stereo Digital Sampler

256MB RAM, 40x CD Rom drive

Emu E64 sampler with 64 Mbyte

RAM

Microwave XT Synthesiser

Microwave Pulse Synthesiser

Korg TR Rack

Synthesiser

Nord Modular Micro Patch

Synthesiser

plus Pentium MMX166 and NEC monitor

Roland Synthesiser

JD990

Korg Prophecy

Korg Wavestation EX

Sequential Circuits Prophet VS

Yamaha Clavinova

Akai S900 Sampler

Roland JV880

Yamaha TG500

Sound and sample CD Roms

Monitoring

Sony F707ES amp

Yamaha P2250 amp

Yamaha NS10 loudspeakers

Alesis Monitor 2 Studio Reference Monitors

Fostex 6301B loudspeakers

Periphery

Tascam DA30 Dat Recorder

Sony cassette deck

Philips CD player,digital output

AIWA portable DAT

Tascam 44 reel-to-reel
calibrated to Ampex
Gold

4 Sony PCM AD-Convertors plus Betamax video
machines
"historical" digital multitrack

Cabling

Entire cabling in the studio balanced
(except MIDI/ consumer equipment)
sole materials used were Neutrik plugs and Gotham studio cable

[The list will be extended in the year 2000 with a Macintosh G4,
24 bit interfaces and a 24-bit DAT recorder]

APPENDIX 3

Stephen Ferguson Curriculum vitae

Stephen Ferguson, born 24.2.55 in Glasgow, Scotland. Parents, James Ferguson and Dr. Hannah Ferguson. Dual British and Austrian citizenship.

High School Graduation
1972 at Eastwood High School, Glasgow

Studies in Great Britain

Matriculated at Aberdeen University in 1973, studied music, specialising in composition and electronic music, English, philosophy (metaphysics and logic) with extra lectures in Art History. Composition seminars with Tona Scherchen and Brian Ferneyhough. Worked from 1974-78 at the A.U. electronic studio with Lyle Creswell on the EMS Synthi 100. Electroacoustic compositions.

Thesis on music analysis of Chopin's Ballades (180 pages) held as paper at the British Postgraduate Conference in Leeds. Founder of the *A.U. New Music Society*.

Graduation 1978 with degree *M.A.Hons.*

1979-80 University assistant in Aberdeen (harmony and counterpoint, piano). Postgraduate study: thesis on Aesthetics and Ligeti's *Atmosphères*. Graduation with degree *M.Mus.*

Voluntary Service in Africa

1978-79 volunteer teacher of street children at *Save the Children*-funded Starehe School, Nairobi, Kenya. Research on and compositions for African instruments.

Piano

1979 external diploma in piano performance of the Royal Schools of Music, London (diploma L.R.S.M.). Performances as pianist.

Studies in Vienna

Since 1980 in Vienna. Entrance exam in German in 1981 ("sehr gut"). Study of Musicology at Vienna University with a Scholarship of the Austrian Ministry of Higher Education. Also English, Philosophy.

Graduation as Dr. Phil in 1990 with a thesis on music analysis and Ligeti's *Piano Music*.

Work in the area of Digital Media

Since 1975 electroacoustics, since 1984 work in the area of computing and audio. Founder of the *Society for Digital Music* in 1985. Seminar trainer in music and technology in Salzburg, Vienna and at the EPT Association. Consultant to Yamaha Europe for MIDI and piano, consultant at Schott the publishers for Digital Media. 1992. Standing invitation as visiting scholar to the University of Stanford at CCRMA (Centre for Computer assisted Research in Music and Acoustics) by Prof. John Chowning.

Production of digital media, CD-Roms in *Macromedia Director* and digital sound design for: University of Southern Mississippi, Philips, Siemens, Daimler-Benz, University of Vienna (numerous productions with students at the Faculty of Humanities, and broadcast of these productions in WDR, DRS, SFB, BR, SWF, ORF), Yamaha Europe, Royal National Institute for the Blind with Mike Busboom (DAISY audio data format enabling blind students to use

reference books) Schott, University of Vancouver, Hochschule für Musik Graz, Mozarteum, VW-Audi, Telekabel and many others.

Assistant of György Ligeti

1992-1996 Assistant of György Ligeti. Work on his projects at IRCAM with Pierre Boulez, Air Studios London with Salonen, Ensemble Modern, Frankfurt etc. One of three senior editors for new music at Schott in Mainz (publisher founded in 1795). Editor of Ligeti, Nancarrow, Korngold. Research on Korngold's *Wunder der Heliane* at the Library of Congress, Washington D.C.

Digital Studio

Since 1984 (four 14bit PCM systems) build-up of own media and audio studio, with systems and equipment by Digidesign, Alesis, Neve, Tube Tech, Eventide, BSS, Dbx, Neumann, AKG, Emu, Sequential Circuits, Lexicon etc. Large collection of MIDI instruments. Work with software such as Logic Platinum, Pro Tools TDM, Opcode Vision, Sound Designer, Waves, Nord Modular. Related interests: programming in Java, HTML, XML.

Commissions and Projects

Numerous works and projects as composer, for styrian autumn, Ars Electronica, WDR Cologne, Edinburgh Festival, Kings Lynn Festival, Hörgänge, ORF Studio Neuer Musik (*The Line* for large chamber orchestra, 1998) Salzburg Festival, Musikverein (2nd Piano Concerto, also as soloist), Konzerthaus Vienna, Sezession (Musik zur Wiedereröffnung, 1985) etc. Solo projects with Hans Gansch, S. Turnovsky (both Vienna Philharmonic), Arditti String Quartet etc.

Music for Beckett's *That Time* with Beckett's authorisation shortly before his death (Vienna Festival Production with Rolf Boysen). Theatre productions *Mephisto* by Klaus Mann, 1995 *Harringer* Deutsches Schauspielhaus Hamburg.

Film music for Fritz Lang's *Diamond Ship* and *Golden Lake* 1919, in Paris 1985, broadcast FS1. Music for Interactive digital TV, and films with Alexander Curtis, Helmut Deimel and Vallie Export.

Awards

Austrian State Stipend for composition, first prize at East African Music Festival for piano, *Katabiosis* chosen as best submitted work for the IGNM World Music Days Festival 1982. *Förderungs Prize* of the City of Vienna for Music, 1989. Grants of the Alban Berg Stiftung, the Scottish Arts Council. Honorary citizenship of the Austrian republic in recognition of creative work 1990.

Lectures and Publications

Lectures at the Austrian Society of Musicology, at the Universities of Oxford, Edinburgh, and Sheffield. Lecture tour in the USA at UCLA Davis, Hartt College, University of San Francisco etc. Invitation to CTI (Computer in Higher Education) at the University of Lancaster, and the ACH conference in Glasgow 2000.

Publication in the *Neue Zeitschrift für Musik* etc. LP *Multitracks*, 1984, *Polyphony* 1986, CD *Piano Music*, Extraplatte, 1987 and *piano wind brass*, Extraplatte 1991. Doctoral thesis published by Verlag Schneider, Tutzing, FRG, 1992.

Travels

In Asia, (South East Asia, India, Middle East), Eastern Europe, North America, the Caribbean, Western Europe, sub-Saharan and North Africa.