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Buddhist Studies in the Digital Age

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Summary

The present paper attempts an evaluation of the situation of Buddhist studies in the age of digital resources and networked communication from the perspective of an individual scholar, as opposed to viewing this situation from the perspective of learned societies or institutions. Attention is drawn to three different aspects: communication, electronic resources, and methods.

Traditional modes both of informal communication and formal communication through scholarly journal articles are contrasted with the new means to communicate using modern computer networks.

Electronic resources presently available are screened and evaluated, with the focus being placed on canonical collections in different Buddhist languages. The main questions asked are reliability and fitness for scholarly research.

As evolving new methodology in Humanities Computing in general, but also in Buddhist studies, markup is considered as a conditio sine qua non in the creation of electronic resources and scholars are urged to get familiar with the basic methods involved.

關鍵詞：1.Modes of Scholarly Communication　2.Electronic Resources 3.Buddhist Information Science　4.Markup

1. Introduction

This is a very bold title and I am bound to disappoint my readers. Nevertheless, I will try to state more clearly what I mean by the key terms in the title and how I plan to deal with them.

By Buddhist studies I understand the serious investigation of Buddhism using whatever means is deemed suitable. It thus draws on disciplines including, but not limited to philology, philosophy, history, archaeology, architecture, epigraphy, anthropology, psychology, medicine, history of art, music and religion and it does so for a variety of regions in Asia, and, more recently, other regions of the world.

The term digital as in digital age is to mean information available in a format suitable to be processed by computers and an increasing array of other devices. The term digital does not bear any information on the nature of the object available in this format, which could be a recording of a ritual on digital video tape as well as a transcription of a manuscript, or, indeed, a digital image of the same manuscript. The sole common denominator of digital information is that it can transmitted with lightning speed over networks, copied without loss of information and interlinked with other digital information without being limited by the original medium of the

information. I will occasionally substitute other nearly synonym terms like "electronic media" for digital information. There is however a distinction to terms like "electronic texts," which specify one specific type of digital medium, in this case a transcription of a text to digital format.

The question, of which this article tries to give some partial answers, is then: How does the study of Buddhism change with more and more aspects of Buddhist traditions becoming available in digital format?

Abounding digital resources and widespread networked communication have already changed not only the way believers

and practitioners gain understanding of their religious tradition,[1] but also the way Buddhist studies are pursued. Both developments in turn need to be reflected by academic research related to these fields. The present article is a preliminary and modest attempt to evaluate this aspect. The impact of the digital age, or of the informational revolution[2] in a very general sense will be discussed with respect only to three different areas, namely communication, resources and methods──areas which are closely related and frequently overlap. While most of the time I will abide to the descriptive mode reserved for scholarly discussions and articles, I will allow myself occasionally to digress into an optative mode, describing what seems desirable to me, rather than limiting myself to mere descriptions of what exists today. On the other hand, there are many aspects of digital information which will be only touched marginally or not at all, for example distance learning and any implications for teaching and education the digital revolution might have. In this sense, as the title of this paper suggests, the discussion is limited to Buddhist studies as a research activity.

The discussion will also be limited in other ways. I will discuss the impact of digital, networked resources on the activities of

individual scholars or informal groups of scholars, but not on institutions.[3] The underlying image of a scholar is somewhat idealistic, as described by Albert Einstein in the following way:

In the temple of science are many mansions, and various indeed are they that dwell therein and the motives that have led them thither. Many take to science out of a joyful sense of superior intellectual power; science is their own special sport to which they look for vivid experience and the satisfaction of ambition; many others are to be found in the temple who have offered their brains on this altar for purely utilitarian purposes. Were an angel of the Lord to come and drive all the people belonging to these two categories out of the temple, the assemblage would be seriously depleted, but there would still be some men, of both present and past times, left inside. [...] [I] f the types we have just expelled were the only type there were, the temple would never have come to be, any more than a forest can grow which consists of nothing but creepers. For these people any sphere of human activity will do, if it comes to a point; whether they become engineers, officers, tradesmen, or scientists depends on circumstances.[4]

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This is an excerpt of a speech given for the German physicist Max Planck on his 60th birthday. The metaphor “temple of science” aptly illustrates the idealistic, almost religious aspect of scholarly activity, which is not driven by any worldly desire, but only by the wish to enhance knowledge and the understanding of a certain field. As Einstein observes, not everybody who pursues scientific research, does this as a purpose of its own right; other goals, such as becoming famous, gaining power etc. are also to be found among researchers. This worldly aspect is not touched upon in this article,[5] but there is a collection of articles, which discuss how electronic communication changes scholarly publishing[6] with an emphasis on the related institutional changes.

2. Communication

2.1. Communication Before the Electronic Age

2.1.1 Informal communication

Systematic investigation of the nature and its causes is said to begin with the presocratic philosophers in ancient Greece. Widely different views on nature,

man, god and the universe have been voiced. Common to all of them has been a need to communicate their views.

Throughout the ages, the development of philosophy, science

and eventuallyreligious studies as a separate discipline, has rested firmly grounded on communication. At the beginning, the primary mode was direct oral communication in marketplaces and other informal settings, later to be supplemented by Plato' s famous academy. The beginning of written communication, like every technological development since then, has been greeted with mixed reactions. Plato, through the voice of Socrates[7] and also in one of his letters[8] raised serious concerns about the written word, which he nevertheless used with remarkable eloquence. Through him, the written word became the major mode of philosophical communication, driven by its virtue of transcending space and time.

Philosophy has to a great deal been a solipsistic exercise, with little or no attention paid by the philosophers to whether or not others share their convictions. The desire to transcend this situation and systematically build a base of knowledge everybody could agree on, brought about the systematic investigation of phenomena known today to us as the scientific methodology. To achieve this, scholars initially communicated with each other by exchanging private letters.

As the number of scholars involved in these discussions grew, it became cumbersome and inconvenient to write letters to everybody. A new means of communication was needed, which was developed by founding learned societies, where new findings and development

would be discussed at meetings.[9] Of course, this only worked well, if the involved scholars where concentrated in a certain geographic area. As Robin Peek[10] recounts it, in the seventeenth century, the number of scholars communicating in this way grew and traditional way of traveling to meetings or sending letters to each other become too inefficient. In 1665, the Royal Society began publishing the first scholarly journal, Philosophical

Transactions of the Royal Society of London. Other journals were quick to appear.

2.1.2. The scholarly journal

The journal provided scholars with a more efficient means of communicating and it was also a handy means of archiving the communication, but it was not intended as a final publication,[11] rather than a progress report on the work done. This characteristic changed over the time, and today, a journal article is in itself a final publication, deeply rooted in the complex academic publishing and reward system. The complexity of the current system required the development of new forms of organizing the scholarly communication, since without indexing and abstracting services, it would be extremely difficult to monitor the developments in a field and contribute to it. An array of different journals serve the same fields or subfields, occasionally even across disciplines, set apart mainly through the reputation that is granted to publications in

them. This reputation depends largely on the review process, which is imposed on submitted articles to ensure the scientific quality of the articles prior to publication.[12] This review process serves as an effective way to filter out not-wanted publications and streamlines the academic discussion.

This overview of the current situation of scholarly publishing in journals would not be complete without a short discussion of the economic site of the publishing process. Once articles are accepted, they will be eventually published, printed and sent out to subscribers by a publisher. The publisher might be for profit or non-profit, or might even subsidizing the journal to send it out with reduced costs or no cost at all. The large academic publishers today all work for profit, in fact they managed to turn academic publishing into a handsome income. The creation of the content of the articles, which is what the subscribers are interested in, is produced without remuneration from the journal, but rather paid for by the employer of the scholar, which in most cases is an academic institution. This same institution than has to pay again for this work in form of a subscription fee to the journal. The only economic benefit to be gained in this whole publication

process lies with the for-profit publisher. I will return to this point later when discussing the alternatives offered by electronic publishing.

2.2. Communication in the Networked Age

The basic modes of communication do not change with a change of media. We still have informal communication between scholars,

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which is carried out mainly in private e-mail or e-mail lists. More formal publications are also increasingly moving to the network.[13] A new mode of communication is the real-time networked cooperation between scholars.

2.2.1 Network mediated informal scholarly communication

E-mail as a whole still is the most frequently used communication mode on the network.[14] A vast amount is direct personal communication between two individuals or small groups. Wherever the use of e-mail starts, the amount of letters written and received increases dramatically, whereas the postage needed is reduced to a fraction. E-mail communication tends to level hierarchical boundaries.[15] This anarchistic character is very successful, where the participants abide to certain unwritten rules[16] of communication,[17] but gets annoying as more junk mail appears. E-mail is also used in so-called “news groups,” the first organized discussion groups to appear on the net. Instead of messages being delivered directly to the recipient' s mailbox,

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specialized news-readers are used to connect to news-servers, who in turn broadcast messages among each other. Sometimes these groups are organized regionally, but in most cases topically. The discussion is typically very informal, being carried out in “threads. ”Due to the heterogeneous nature of these groups, where everybody who is connected to the Internet can drop in any time to make any comment, a significant portion of the messages might not be relevant to the topics under discussion. It has turned out therefore, that most of these groups are not suitable for academic discussions.

More popular with scholars is generally the e-mail mailing list. In this case, the participants register with the list-owner[18] and thus become members of the mailing list. They then typically receive an introduction to the purpose of the list, how to send messages, what kind of messages are suitable for the list and so on. Members of the list will send messages to all other members of the list by sending it to the list address, from where it is redistributed to all list members. The basic function of an e-mail list is thus remarkably similar to the early function of scholarly journals: To enhance direct communication between members of a community of shared interests. Since most e-mail lists are archived, they also serve the purpose of putting this communication on a record. In the field of Buddhist studies, there have been several attempts at managing a mailing list.[19] Many of them suffered from being

flooded with messages from people with interest in Buddhism, but little or no background and no academic interests. The latest and so far remarkably successful attempt was the creation of the budschol list in May 1999 by A. Charles Muller. Here is a quotation from the introductory message of that list:

> Nowadays, however, it is very easy to start up a free listserv, [...] I have entitled it as the "Buddhist Scholar' s Information List. " It will be a restricted list (no one will be able to join without my approval), and I will be limiting it strictly to scholars. It' s purpose will not be discussion, so no one will be burdened with a daily avalanche of unwanted messages. The list will be used instead, for simple announcements of resources, events and other information, or for the seeking of such information. I will promise to keep it that way.[20]

Within a couple of weeks, the number of participants grew into the hundreds. In addition to the areas mentioned above, major publishers are now sending detailed announcements of new publications to the list, members are publishing reviews of books and other research resources and are tracking articles relevant to the field in over 30 journals. Within a short period, the list grew to become an indispensable tool for anybody who wants to stay current in Buddhist studies and provides it services more efficiently than any journal could do.

2.2.2. Scholarly journals and articles on the Internet

Given the economics of the publication of scholarly journals outlined above, the advantage of electronic publication seems

immediately obvious: With electronic journals available at no cost worldwide the scholar as author has the potential to reach a very large audience.[21] And the scholar as reader has immediate access to a wide range of publications relevant to his work.

This vision however has not become reality and has, in fact, faced fierce opposition—not surprisingly from established academic publishers, but also from many well established academics themselves.[22] The major issue disputed here is, how can the established way of secure quality and reputation of publications be carried to the new medium.

Within the field of Buddhist studies, the most longstanding and successful electronic journal is the Journal of Buddhist Ethics, established in 1994 by Charles Prebish and Damien Keown.[23] According to Charles Prebish, the first and most important motif for attempting electronic publication was the impossibility to ensure funds for a traditional publication in a rather small subfield.[24] Apart from the publication medium however, every effort was made to follow the example of established journals in setting up a board

of editors and ensuring blind peer-review of submitted articles. During the five years of existence, the journal has proved both the feasibility of this undertaking and established itself as a journal with a remarkable reputation among its audience. Many other electronic journals are rapidly appearing, and it is becoming increasingly difficult to keep track of these developments.

The majority of journals, however, are still published in print. Some publishers, trying to direct trends in online publishing in a direction beneficial to them, started to give subscribers of the print publications access to electronic versions of the same publications. This is typically done

on base of either a single license, a site-license for the whole subscribing institution or on a pay-per-view agreement. This effectively blocks out small institutions, individual researchers and researchers in remote places—all these groups that would greatly benefit if the journals became available for free.

At this point, it might be interesting to see how other disciplines are dealing with this issue. Quite predictably, the hard sciences and especially the physics are well advanced in electronic publications of their research results. In May 1999, the National Institute of Health (NIH) of the USA issued "E-BIOMED: A proposal for electronic publication in the biomedical sciences."[25] Its prologue starts with the statement:

The full potential of electronic communication has yet to be realized. The scientific community has made only sparing use thus for of the Internet as a means to publish scientific work and to distribute it widely and without significant barriers to access.[26]

In response to this statement, Stevan Harnad points out that "It

is now both an empirical and a historical fact that well over half of the current physics (journal) literature is freely available online from the Los Alamos Archive and its 14 mirror archives worldwide, and is being used by perhaps 50,000 physicists a day."[27] This is indeed a remarkable fact. P.Ginsparg, the founder of the Los Alamos archive, describes some major issues surrounding the establishment of this archive and lessons learned from them in his article mentioned above.[28] He comes to the conclusion:

The essential question at this point is not whether the scientific research literature will migrate to fully electronic dissemination, but rather how quickly this transition will take place now that all of the requisite tools are on-line.

A similar archive has also been set up in computer sciences, where the academic association of this field has taken the necessary steps to provide a pre-print archive for articles.[29]

An important question needs to be asked here: What is the position of the individual scholar in this process? In trying to answer this, I would like to look at a recent exchange on the HUMANIST discussion list.[30] On August 3rd, 1999, Chris Ann Matteo asked:

Dear Colleagues, I' d like to gather some opinions about wise strategies for sharing pre-publication academic essays on the WWW. I' ve just returned from a conference, and we have been encouraged

to submit abstracts or full-text papers to be mounted on the conference website (it is envisioned that this website will develop into a more comprehensive resource for the study of this subject). These papers have already been delivered in person.

What copyright protections apply?

I feel divided and uneasy about my own participation in this project. The work I presented derives from my dissertation that I hope to defend in early Fall 1999. I have plans to either seek out a peer-reviewed journal or a book publisher. I dive into a job-search following my defense.

While my spirit of scholarly exchange leads me to contribute, I hesitate to circulate this material at this transition in my career. My inclination is to submit the abstract and leave it at that until long-range print publication plans firm up.[31]

Instead of considering the overall advantage of having the conference papers available to everybody for free, she finds herself troubled by problems that might arise from sharing the results of her research in this manner. This is a very common reservation and frequently seen, not only among young scholars just at the begin of their career. In answer to this enquiry, Jean-Claude Guedon writes:

It is interesting that the scholar-as-reader behaves significantly differently from the scholar-as-author. In the former case, he or she insists on the widest possible access to journals and books within the University library; in the latter case, he or she insists on the highest visibility, prestige, status, independently of the cost of the journal that the library will have to buy later.

This is even worse when the scholar puts on a third hat, that of the editor, and does it for a company like Elsevier. Elsevier sells scientific journals (about a billion dollars worth of sales per year) and makes a cool

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40% profit in passing. Fundamental knowledge produced largely thanks to public money is then written up for free, refereed for free. When the article is submitted, some commercial journals already request a small fee (a "ticket modérateur" of sorts); when it is accepted, the author(s) often must pay so much per page. Then the journal is produced with little added value and it is sold at incredible prices. And it is sold to libraries that, by and large, are supported by public money. In effect, through this technique, some commercial outfits have managed to create a kind of tax on governments across the planet, or at least across the OECD nations (i.e. the richest nations of this planet). Very clever indeed! Not very equitable, nor very functional. It impedes the free flow of scholarly information among scholars; it tends to discriminate against poorer institutions, as well as poorer countries.[32]

He then goes on to suggest a similar digital archive for papers in Humanities Computing as is in place in physics and in related fields and is being discussed in the biomedical sciences. A few days later, the original poster, Chris Ann Matteo reports how she solved her problem after considering the advice she received from the discussion group:

I opted to mount the full-text of the talk on my own account and link it to my online vita. Thus I coded and maintain both of these documents. I gave the link to the webmaster of the conference website, and now it is linked also to that source. The file is headed and concluded with very scary (although perhaps vain) copyright statements. I plan to seek either a peer-reviewed print or online journal, but it will remain as a convenience, a part of my online record, until such a venue is secured.

I think this has a lot of advantages and limited risks. As long as I remain active in seeking another publication venue for it, I think the

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chances of it being scooped by another qualified academic are slim-after all, several authoritative pairs of eyes and ears were at the talk. Students might steal it, sure, but I have a hunch that Bakhtin' s critical jargon would be a clear tip-off.

As an advantage, folks whom I have met at the conference and I can exchange work at a low cost. Like sharing my phone number, I can choose with whom I share the link──and likewise, it' s not always possible to avoid a random obscene phone call or an impertinent salesman. I have chosen to do this for another paper I am scheduled to give at NASSR' 99 on Sunday. I have a rather unappealing time-slot in the program (one of the last sessions on the meeting' s last day ...), so this way I can mention it to folks I meet at the conference, in advance of the actual talk, and perhaps I will be able to get some timely feedback even if audience turnout is sparse.[33]

This is one of the obvious solutions to this dilemma. It serves as a temporary solution to the problem at hand, but has some serious drawbacks: (1) No review process is involved, therefore, the paper itself will hardly be granted the credit reserved for articles in traditional manner. (2) Since the author is effectively the publisher, nobody prevents the author from incorporating later changes to this article after “publication”──which would greatly undermine scientific discourse if this practice became widespread. (3) No reliable agency or institution will take steps for long-term maintenance of the publication. Guedon, Ginsparg and Harnad argued exactly for these reasons for a public archive, where authors could self-archive their articles after or prior to publication in established journals. This is not the place to go into any further discussion of this topic. I would like to point out however, that in the field of Buddhist studies, an archive similar to the ones

discussed by Guedon, Ginsparg and Harnad has been quietly evolving. In addition to the extensive bibliography of books and articles[34] pertaining to all areas of Buddhist studies, which has grown to more than 85000 items by the time of this writing, Venerable Heng-ching (釋恆清) has actively sought permission from authors of articles in the field, to include copies of their work. This is an ongoing effort and has already resulted in several hundred items being freely available worldwide, including complete journals like the Chung-Hwa Buddhist Journal or articles related to Buddhism from

Philosophy East and West. On a longer term, however, it can not be expected that one single institution will take on the tedious task of writing to the author of every single article to seek permission for inclusion in this archive of Buddhist studies, rather, the authors should themselves see this as a way to make their own publications more visible and thus self-archive their work here. Discussion is urgently needed on how to set up a new archive for this purpose or modify the existing one.

3. Resources

3.1. Digital Resources Become Available

It will be impossible and quite useless to try to enumerate the resources prevailing to Buddhist studies on the Internet available today. Due to the great variety and number of materials available, this in itself would be a huge undertaking, quite beyond the scope of this article. Furthermore, such a list would be outdated immediately, even faster than the proverbial outdating of traditional bibliographies and field introductions: the Internet is truly impermanent with new resources becoming available every moment and other resources disappearing at the same time.

What I would like to offer here instead is a very limited and selected overview mainly of canonical texts with just passing mentioning of other resources. In the important case of the Chinese canonical collections, which in scope and weight are by far the most important digital resources becoming available, I will also provide some background on the history of the projects related to this; in most other cases I will only introduce the project with very few words.

The main purpose of this brief enumeration is to go beyond the listing and evaluating of individual projects and resources and try to evaluate what the availability of them collectively means. While books and articles and other traditional publications are interwoven only in the minds of their readers,[35] electronic resources have the potential to make this interwoveness explicit and put it to the readers use.

3.1.1 The Buddhist Studies WWW Virtual Library

T. Matthew Ciolek has been one of the earliest witnesses of the advent of the Worldwide Web and one of the first to realize both its potential and its limitations by giving completely chaotic access to such a vast variety of resources. His answer to this problems has been the establishment of the Buddhist Studies World Wide Web Virtual Library. He introduces the page himself as follows:

[Est. : 5 Sep 1994. Last updated: 11 May 1999.] This document keeps track of leading information facilities in the fields of Buddhism and Buddhist studies. Please register any new resources or mail tmciolek@ciolek.com if you are interested in administering

any specific area within this Virtual Library (VL). Your input will be gratefully appreciated.

This research tool is provided by www.ciolek.com and is regularly updated. The page optimised for transmission speed, not for fancy looks. Currently this and related pages provide direct WWW links to 327 specialist information facilities world-wide. All links are inspected and evaluated before being added to this Virtual Library.[36]

The most important fact here is not the number of links, but the evaluation process to which every resource is subjected to before being added to the Virtual Library and the fact that the links are regularly checked for accuracy. Ciolek has thus created a reliable and up-to-date inventory of Internet resources relevant to Buddhist studies. Over the time, he has gradually being able to share the burden of this time consuming task with a growing number of co-editors in specialized areas. This page is thus one of the best starting points for a tour of Buddhist studies Internet resources.

Some other important resources shall at least shortly be mentioned here. The Huntington Archives at Ohio State University[37] have become the Internet source for Buddhist art. A. Charles Muller is maintaining an ever growing dictionary of East Asian Buddhist terms.[38] This is the first dictionary ever on any medium to bring together a sizeable list of terms with readings in Chinese, Japanese and Korean and their counterparts in other Buddhist

languages, mainly Sanskrit and Pāli. The articles are sometimes encyclopedic and a good starting point for further research. The coverage closely reflects the authors personal

research interest, a limitation that is likely to become less and less relevant, as the dictionary moves towards becoming a collaborative project and more researchers become involved. The last project I would like to mention briefly is the International Dunhuang Project[39] at the British Library, maintained by Susan Whitfield. This project has made accessible the Stein collection of Dunhuang manuscripts on the Internet, where researchers can log on and contribute directly to the identification of the fragments.

3.2. Canonical Collections

The canonical collections obviously are among the most important sources for almost every aspect of Buddhist studies. I will discuss collections in Pāli and Chinese in greater detail, while mentioning other collections only in passing.

3.2.1. Pāli

The canonical collections in the Pāli language were the first to be completely available in digital form. Currently, there are four different versions, all based on different textual sources.

A. Thai Version of the Pāli Tripiṭaka

This project was conducted at Mahidol University' s Computing Center[40] from the late eighties. First releases have been seen since the early nineties, with subsequent updates. Currently, the text database known as BUDSIR, which is in a proprietary format and only accessible through the reader provided by Mahidol University' s Computing Center,[41] contains the whole Thai Tripiṭaka and its commentaries, in Thai and Roman script, including page

references to the Pāli Text Society editions. Early commercial distribution

was on copy-protected hard-discs, and recently the format has been supplemented by CD-ROM.

B. Pāli Text Society edition

A digital edition of the Pali Text Society edition of the Pali Canon on CD-ROM has been produced by the Dhammakaya Foundation. This commercial CD-ROM, released in 1996 contains the whole text of the Pāli Text Society edition, together with a MS-DOS based interface for searching and reading.

C. Pāli Tripiṭaka in Sinhala script

The input of the entirety of the words of the Buddha and his immediate disciples, as preserved in the Sri Lankan version of the Pāli Tripiṭaka, was completed at the Siri Vajiranana Dharmayatanaya Bhikkhu Training Center, Maharagama, Sri Lanka in 1994. The texts, consisting of an estimated thirty five million characters, were keyed in over a period of three years, starting in 1991. The edition used as the basis for this was the Buddha Jayanti Tripiṭaka Series in fifty-eight volumes, published under the patronage of the government of Sri Lanka (Ceylon) during the 1960s and 1970s. The project was carried out under the auspices of Venerable Madihe Pannasiha Mahanayaka Thera, Head of the Amarapura branch of the Buddhist Sangha in Sri Lanka, with financial sponsorship from the Chandraratne family.

This edition is available on-line from the Journal of Buddhist Ethics web-site. This electronic edition is not yet fully proof-read, but the files can be freely down-loaded for personal use. The text is released under the Gnu Public License (GPL), a license designed by the Free Software Foundation for their software releases. Based on this license, the text can be used, incorporated into other projects or otherwise given some added value, provided the new source text is also made available freely to all future users.

D. Chattha Sangaya (Sixth Council) edition

This version is based on the text as authenticated during the Sixth Council (1954~1956). It also contains a number of extra canonical texts. All texts are in Pāli, but they can be displayed in Devanagari, Roman, Myanmar, Thai, Sri Lankan, Khmer and Mongol scripts. The texts can only be displayed using the software included on the distribution CD-ROM, which is designed only for MS-Windows. Cross-references to the PTS editions are included with the text and a Pāli-English and Pāli-Hindi dictionary is provided. The CD-ROM, which is produced by the Vipassana Research Institute is distributed free of charge.[42] With the help of software developed by Frank Snow and available on the Internet,[43] the texts on the CD-ROM can be converted to HTML, and can be displayed in standard web browsers on any platform.

E. Comment

Out of the four versions of the Pāli Canon available today, only one is freely accessible on the Internet, but this version is marked as not yet satisfactorily proofread, while the proofreading status of the other versions is not known. One more version is distributed without charge on CD-ROM and can be converted to HTML format. The other two are commercial and in a proprietary format not accessible to other software.

Which of these versions is most suitable for academic research? This question is not easily answered. Since proprietary formats seriously limit the use that can be made of the canon as a digital resource, little is possible beyond using it as a fancy index to the printed versions. Frustration will also come from the fact that even typing errors cannot be corrected in these versions. With the Sri

Lankan version, although available through a reliable academic journal, it is not released in satisfying quality, therefore the best option so far is the text released from the Vipassana Research Institute freed from his proprietary format with software by Frank Snow. This could be used not only for searching, but also processed with text-analysis software, enabling a wide range of additional uses. Most importantly, the text could be corrected, annotated, and aligned with other versions in any way the researcher deems useful.

3.2.2. Towards a digital version of the Chinese Buddhist Canon

A millennium ago, in the Five dynasties period and early Song China, followers of the Buddha were among the first to apply the newly invented technology of printing to their holy scriptures, creating what came to be known as the Kaibao Tripiṭaka (《開寶藏》). In our time, we are witnessing the advent of information technology and networks that can provide instant access to an overwhelming wealth of information. Again Buddhist groups have been among the first to apply this technology to their cultural heritage. Many have dreamed of having the whole Tripiṭaka available on a shiny little CD-ROM or, more recently, having it available for worldwide instant access on the Internet.

And the vision does not stop here. Scholars dream of dictionaries, modern commentaries and scholarly articles and other reference works linked to this resource, while believers dream of their master' s collected sayings becoming part of the canonized scriptures by receiving similar inclusion to the digital Tripiṭaka, as well as multimedia resources, pictures, video films and sounds all joined together and available worldwide just a mouse-click away. We have a good chance of living to see this coming true──although perhaps not exactly the way we can presently imagine──if we take the right steps today on the path to this goal.

A. Early developments

The last years have seen various efforts towards this end. Professor Lewis R. Lancaster of the University of California was among the first to realize the potential of this development and the enormous need for exchange, cooperation and standardization in this field. In 1993, he assembled delegates from various Buddhist electronic projects in different languages and scripts, and founded the Electronic Buddhist Text Initiative (EBTI) as a forum for exchange of information and sharing of technology among these projects. Subsequent meetings of the EBTI have been held at Haein-sa (海印寺), Korea in 1994,[44] Fokuang Shan (佛光山), Taipei in 1996[45] and

Otani University (大谷大學), Kyoto, Japan in 1997[46] and, together with PNC,[47] ECAI[48] and SEER[49] at Academia Sinica (中央研究院), Taipei in January of 1999.[50] The next meeting

will be held at the University of California Berkeley in January 2000.

There are of course plenty of other efforts, both modest and bold, small and large-scale in all countries that share the heritage of the Chinese Buddhist scriptures. The more important ones include different groups and individuals that the late Prof. Ejima Yasunori (江島惠教) of Tōkyō University in Japan assembled over the years to help him realize his vision of an electronic databases of the Taishō Tripiṭaka (《大正新修大藏經》). This project became a working group under the JAIBS (Japanese Association of Indian and Buddhist Studies 印度學佛教學會) and was at times closely cooperating with Daizō Shuppansha (大藏出版社), the publisher of the Taishō Tripiṭaka. The outcome of this cooperation was planned to be a series of CD-ROMs of the Taishō Tripiṭaka, one CD-ROM for each volume, despite the fact that technically the whole Tripiṭaka would easily fit on one single CD-ROM. This and some other factors like high pricing and a failure to understand the special needs and features of the electronic medium led this venture to abject failure and eventually this undertaking was discontinued after the publication of only four volumes. The group around Prof. Ejima has recently reassembled itself under the name SAT (see below).

At the small International Institute for Zen-Buddhism (國際禪學研究所) in Hanazono University (花園大學), Kyōto, Urs App conceived in the late 80's a project he called the Zen-Knowledgebase project. His aim was to put all information relevant to Zen-Buddhism, that is the original scriptures, commentaries, translations, bibliographies, maps, photos, video-films and much more into a connected computer database. This ambitious project set off with a planning for the first ten years in 1990. The present author joined that project in 1992 and contributed to its first widely known product, the "ZenBase CD1", which was published in 1995. This CD-ROM could be seen as a snapshot of the projects workbench,

with Zen-Buddhist texts released on it together with a number of research tools and utilities, designed to enable the researcher to make best use of these material. Its main purpose had been to explore new and imaginative approaches to the electronic medium and to encourage others to the likewise.[51]

Another important and bold step towards a complete version of the Chinese Buddhist Tripiṭaka was taken in Korea. Korea houses the only surviving complete set of wooden printing blocks for a Chinese Tripiṭaka, the carving is believed to have been completed more than 750 years ago, in the middle of the thirteenth century.[52] Today these woodblocks are kept in a house built for this purpose on the grounds of Haien-sa temple in central South-Korea. It is this treasure that inspired plans to preserve these woodblocks by putting them in digital form, thus continuing the spirit of innovative application of technologies that surrounded the age of the carving in the thirteenth century, when the Korean peninsula witnessed printing with movable letters 200 years before this technique was applied by Johannes Gutenberg in 15th century Germany. The plan received encouragement and increasing support after the EBTI meeting and with additional founding from a large company in Korea the input could be completed and a first CD-ROM be produced by January of 1996. This CD-ROM tried to faithfully reproduce the image of the printed page, including vertical rendering and even the interlinear notes in smaller print are reproduced here in the same way. Still more amazing, the great variety of character shapes that are found in woodblock prints are ported to the electronic text: Over 30,000 different character shapes have been used in the roughly fifty million characters of this CD-

ROM, compared to only about 12,000 in the modern Taishō edition, which has far more than double the amount of text.[53]

Since this phenomenon is seen over and over in CD-ROM releases of (not only) Buddhist texts, it might be worthwhile to shortly digress into the question of the fundamental differences of printed and electronic text. When printing was used by Johannes Gutenberg, its first aim was not to easily

produce texts for mass-circulation, rather he placed a big effort in re-creating the beautiful pages that the best scribes of his age could produce. He went to great lengths in ensuring this quality and his set of letters included almost 300 different types for the letters of the alphabet. The merits of printing, the use the new medium could have, which led to newspapers, libraries, catalogues, librarians, bookshops and so on, was discovered only later. In the same way, the electronic texts of the first generation still not go beyond the limited paradigm of the printed page, although the electronic text can be so much more powerful!A certain spot on the screen can not only be printed with one static letter, but magically can transform to what ever the reader wants to see there! It can show the text as a true copy of one (of several) historical editions, can show it in modern printed style, can use abbreviated or traditional forms of characters, can show sutras in their expanded or compressed form and so on. The text can also interact with other material which might be available on the user' s machine, or even somewhere in the wider space of world-wide networks. We thus will gradually realize the full potential of electronic text and not limit ourselves by the narrow image of traditional printing!

Taiwan has also seen a great number of efforts to contribute to the task of our age and help digitizing the Buddhist scriptures.

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Due to technical difficulties and lack of coordination, there are a lot of Buddhist electronic texts available on the network, but of very different quality and rather limited scope. A considerable number of texts have been input by the Academia Sinica, but most of them are available only for members. There have been, however, some remarkable research tools becoming available. For example, the excellent Fokuang Buddhist Dictionary (《佛光大辭典》) has been put on CD-ROM in a very useful way and has been made available for a reasonable price, and, more recently, the collected works of Venerable Yinshun have also been made available for free on CD-ROM with a powerful search engine.

B. Recent developments

The last years have seen some remarkable developments towards the creation of a complete full text database of the whole Buddhist Tripiṭaka in

Chinese. In January 1998, the above mentioned group SAT[54] (representative: Shimoda Masahiro 下田正弘, Tokyo University), made up of Japanese Universities and members of the JAIBS, signed a contract with Daizō Shuppansha and was granted the right to create an electronic database of the Taishō Tripiṭaka and distribute it over the Internet. The project is scheduled to complete its task by 2006. At the September 1999 business meeting of JAIBS, the steering committee recommended the full support of the association for the projects, whereas previously, only a small faction of the organization had been concerned.

In February 1998, the Chinese Buddhist Electronic Texts Association (CBETA, 中華電子佛典協會) was founded by Venerable Hengching (釋恆清), Taiwan University and Venerable Huimin (釋惠

敏), National Institute of the Arts, to coordinate efforts in Taiwan and promote the creation of a new scholarly digital edition of the Chinese Buddhist scriptures. The present author was attending the founding meeting and joined CBETA in April 1998 and works as an adviser to this project. CBETA is not going to start all over again with input of Buddhist texts, but rather aims at collecting and proofreading materials that have been inputted elsewhere, and thus ensuring a high reliability throughout the database. CBETA has received a grant from the Yinshun Foundation of North-America and plans to consecutively release the complete canon of Buddhist scriptures (again according to the Taishō collection) within three to five years. A first release of six volumes of the Taishō Tripiṭaka, both on CD-ROM and on the Internet was made in December 1998.[55] By the time this article goes to print, it is expected that the first 32 volumes of the Taishō collection will be freely and publicly available through the CBETA homepage. CBETA is making every effort to encode and markup the text using internationally developed and widely used open standards like XML and TEI.[56] CBETA is also closely cooperating with SAT on such important issues like the representation of rare characters in the texts.[57]

As a completely separate development, it became known in early 1999 that a Buddhist group in Hong Kong managed to put the whole Chinese Buddhist Tripiṭaka on a CD-ROM.[58] From the table of

contents it may be concluded that this CD-ROM contains material almost equivalent to all 85 volumes of the Taishō Tripiṭaka. Unfortunately, the text is not readable with software other than the reader provided on this CD-ROM, which requires a Traditional Chinese version of MS-Windows. As in the case of the Korean Tripiṭaka, this software goes to great lengths to imitate the appearance of a book on the screen, but completely misses the new possibilities the electronic medium offers.

3.2.3. Other textual collections

Texts, collection catalogues and other reference material in Tibetan has been made available since the early nineties through the Asian Classics Input Project.[59] The project' s aim was not only to preserve the Tibetan cultural heritage in digital form, but also to actively help Tibetan refugee communities by employing and educating them for participation in this project. The limited funds have thus been put to very good use in more than one aspect. So far, less than one fifth of the Kangyur and about one quarter of the Tengyur have been made available.

Buddhist texts in Sanskrit have so far not been systematically input, and there are only scattered texts available on different places on the Internet.[60] It is highly desirable for the future, to systematically collect these and make efforts to close the gaps in the textual representations.

Extensive collections of translations, mostly based on the Pāli

Tripiṭaka are available on the Internet now in English[61] and German.[62]

4. Methods

The most interesting question related to Buddhist studies and electronic media certainly is, how will the networked communication and the abounding digital resources affect the research done using these means?Will we have new paradigms, new methodologies, new fields of knowledge opening up by use of these ? If this were not the case, the whole undertaking would be an enormous waste of time and energy.

When talking about these issues to colleagues, a frequently encountered attitude is “these technical questions should best be left to technicians, while researchers should not waste time bothering with this. ”This is a very dangerous misconception. I have to kinds of answers to this:

(1) In the early days of the automobile, a driver had to know his vehicle from the inside out. He had to be prepared for all kinds of unexpected situations and be creative in finding ways to get the vehicle moving again. It was unthinkable in those days, to drive a car without knowing the machine inside out. However, even in those days, it was not the driver, who decided where the vehicle was going, he only took the necessary steps to go wherever the passenger wanted to go. Nowadays most of the complexities of driving a car have been removed and virtually everybody is capable of driving. Not the same is yet the case when it comes to the handling of computers, where incompatibilities between programs, platforms and internal encodings in many cases still require a rather intimate knowledge of the inner workings. Since the scholar

is the one who gives the directions and decides where to go, he needs to have some understanding of the underlying technological issues and a vision of where he wants to be some years from now.

(2) We must also be sensitive to the essence of scholarly activity. A scholar who is researching an early Buddhist text known so far in Sanskrit and Chinese, obviously needs to know both languages in order to be able to conduct his research. If, at a later date, another much different and enlarged version in Tibetan is discovered, his research would be greatly hindered, if he were not to learn Tibetan, and there should be no reservation against doing so. If it now turns out to be necessary to learn a computer language, say, Perl,[63] to conduct a certain type of research——why should our researcher hesitate to learn a language that is far less complex than any living language and gives him so much for his research?

But I am not going to discuss computer programming any further here. Instead, I will introduce some of the methodology needed to glue the array of different resources introduced in the preceding section together and make it useful for research. Not surprisingly, this again has a lot to do with communication.

4.1. Markup and the Need for Open Standards and Cooperation

Now what is the overall picture we get from here and how are we going to proceed? It is quite obvious, that it is the task of our generation to give our cultural heritage a new life in the digital

electronic medium, where it can instantly be shared with people that are connected to the computer network all over the world. This task involves care for preservation; ideally our work should be as long-lasting as the wooden blocks in Haien-sa, that were carved more than 700 years ago and ensured the transmission of the Buddhist scriptures down to the present day.

But how can we, in the ever-changing world of computers, expect something to be usable and useful after 10 years, let alone 100 or more years? There can be no guarantee for this, but one thing is obvious: We need to use open standards to give shape to our electronic texts. As mentioned above in passing several times when describing some textual resources, texts that are available only through one specific software will become useless in no time, since they are locked into systems that are becoming rapidly obsolete. We, the users of electronic resources need to ask the suppliers to conform to open standards, to provide texts and other material in a way that can be used in a multitude of software on a multitude of platforms, now and in future. As creators of electronic resources we must write this in our grant proposals and task descriptions so that we do not end up creating results that are already obsolete upon publication.

This task also involves the interoperability of different electronic resources. In the same way that we can quote a book in any other book, we want to be able to connect different electronic resources, texts, dictionary entries, maps, biographies, historical or exegetic material audio or video clips and so on. How can we achieve this? There is only one solution: Again all creators of electronic resources should use a common set of open standards.

What are open standards? Open standards are definitions of behavior for computer programs or of a format for computer data that are defined independent of any particular computer environment or vendor. It is exactly open standards that enabled the Internet to function as it does with its millions of computers

interacting, where old mainframes from the 70' s can exchange information with latest supercomputers and fashionable notebooks without any problems.[64]

What standards do we need and who defines them? There is a standard designed for the markup of electronic texts and endorsed by the International Standards Organization (ISO) in 1986, defining the Standard Generalized Markup Language (SGML).[65] This standard defines the syntax of markup and is used for example in the hypertext system that lays at the base of the graphical interface to the Internet, the World Wide Web.

It might be appropriate at this point to say a few more words about markup. The term originated in traditional printing, where markup are little marks or hints inserted in a text to tell the printer about headlines, font changes and the like. With electronic texts, markup came to mean any way of inserting any kind of meta information into a text. This needs to be done in a systematic and standardized way, since it is intended to be used by computers, but it is also intended to be read and written by humans, so it can' t be too terse.

Using SGML as the syntax, an international group of more than one hundred scholars from various fields of the Humanities formed the Text Encoding Initiative (TEI) and worked over more than seven years under the auspices of three learned societies called to define

some Guidelines for the Encoding of Electronic Texts,[66] published in 1994. Today these guidelines are being implemented by a great variety of electronic text projects worldwide. There are of course specific needs in Buddhist texts that are not addressed here. The above mentioned EBTI is trying to give recommendations and develop guidelines for the specific needs of Buddhist texts and resources, but the work in this field is still in progress. Since these guidelines will be only useful if they address and solve all the problems found in encoding Buddhist texts, it is quite obvious that the more parties involved in the creation of such texts are involved in creating these guidelines, the better they will serve the purpose.

Using standardized markup for the creation of digital resources for Buddhist studies is a conditio sine qua non for any further development of methodologies. Researchers need to be able to incrementally add comments, definitions, pointers to related material as well as other meta information about a text. Markup, in combination with other knowledge representation strategies[67] can express the inherent information and retrieve it in ways that enable surprising new discoveries.

In the field of Buddhist studies, great advances can be foreseen for philological and linguistic comparative studies, authorship studies and similar areas, where the available data are very complex and incoherent, which makes it difficult to draw sound conclusions without the help of computers. This in turn will greatly enhance our knowledge of Sanskrit Buddhism and the early translation

process as well as the textual criticism of Buddhist texts in the various Indic, Central and East Asian languages.

4.2. Methods for Combining Digital Resources

As has been indicated, digital resources can be of very different types. New methods are needed to combine different types and explore there mutual redundancy. A digital image of a manuscript and a transcribed version of the same manuscript are redundant in the sense that they can, in a rather vague sense, be considered as carrying the same information. The digital form they take, however, does not bear any resemblance to this fact and no relationship could be discovered by just comparing the digital entities containing this information.

To describe a way how such digital entities can be combined, a model for multivalent documents has been developed by Thomas A. Phelps and Robert Wilensky.[68] Documents in this model are called multivalent, because they provide different projections of the same entity. The model gives a theoretical framework how these documents can interact and what properties derive from such an interaction.

An example might be appropriate to explain this. To digitize some Chinese text this text could be scanned with a scanner and stored as an image of the text. This image contains the text in the exact same shape as on the original paper, although, depending on the scanning resolution, the edges of the letters might be somewhat ragged, and the image can not be searched for some terms occurring in the text. Another way to digitize this same text would be to type

the characters into a computer using a keyboard, creating an electronic text document. The text would now most likely have a different shape—some characters might look slightly different, line breaks occur at other locations etc, but it allows searching for keywords. The different digitization methods provide documents with different properties, suited for different use. The multivalent document model describes how these different properties can be combined to gain the best of both sides. It is easily imaginable, how for example a text database, maybe even a cumulative edition of different manuscript traditions, could be linked to different sets of images representing these manuscripts. While the multivalent document model provides the theoretical framework for this, markup is the method to actually implement the linking required.

4.3. Is there a Positivistic Tendency in Research Methods Based on Digital Resources?

Computers are good at representing any clear-cut information by dividing it in small units of 0 and 1. This fits together very well with certain scientific analytic methods, where entities are divided further and further to make them more understandable.

Digital resources in Buddhist studies will enable researchers to make hitherto impossible definitive statements and arguments ex negativo: It used to be very difficult to verify a scriptural quotation, say, from the Mahāprajñāpāramitā sūtra in 100,000 lines; due to its size nobody could be sure not to have overseen a passage. Now it can be stated with certainty whether a quotation appears in a scripture or not.[69] It will also be much easier to trace mutual dependencies of scriptures and exegetical traditions.

There is however a difficulty when it comes to issues more remote from the actual wording of the texts. Philosophical or soteriological concepts can be expressed in many different ways and discussions of different arguments are by no means clearly divided into neat sections, rather they overlap or relate to each other back and forth in a complex web of citations, allusions and metaphors. It will be very difficult to find appropriate ways to encode these aspects into digital resources, which in turn might lead researchers to ask only questions more easily answered with the tools available. Although we do have a new, extremely versatile tool at our disposal, we should use it only where its use is appropriate and continue to use the existing methods where they provide a better path to the answer.

5. Conclusion

This paper has tried to evaluate some of the impact digital resources will have on the field of Buddhist studies. It has showed how changes in communication facilities greatly improve accessibility to resources scattered around the globe and how this promises to advance knowledge in this field. By looking at examples from other fields like physics, biomedical sciences and computer science the service a comprehensive archive of research articles does to the research community was established and the desirability of such an archive was stated. In the field of Buddhist studies, an archive with a similar purpose does exist on the Web site of Taiwan University' s Center for Buddhist Studies, which could be adapted to better meet the needs of the research community.

With respect to electronic resources available now on the Internet or on CD-ROMs the main focus was placed on canonical collections. It was found that although many texts and whole collections are becoming available, their use is frequently limited due to the failure of using open standards and access methods that are available on different platforms.

It was therefore found extremely necessary for scholars in the field of Buddhist studies to realize the need for the cooperative development of open standards for text representation and markup, with markup being the single most important methodology introduced with the advent of digital texts.

數位化時代的佛學研究

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提要

本論文擬以非學術團體的個人學者立場，評估佛學研究領域在資料數位化和網際網路溝通的時代現況。本文將著重於通訊溝通、電子資料和研究方法三方面討論之。

傳統的透過學術雜誌論文等正式溝通模式或非正式模式，皆與近代以電腦和網絡傳達媒介方式不同。

另外，進行目前的電子資料審查和評估時，應特別注意各種佛教傳統藏經大量的資料庫。於此，最重要的問題是資料庫的可靠性和是否適合研究用途。

無論是正在發展中的人文科資訊領域或佛學資訊，各種資料的標記（markup）爲製作電子資料中一個不可否認的條件，所以學者最好具備接觸此新的基礎方法。

關鍵詞：1.學術溝通模式　2.電子資料　3.佛學資訊　4.標記

[1] It should be noted that improved accessibility is not an insignificant development, it can be seen as one of the causes for the attempts to reform the Roman Catholic church in the late 15th and early 16th century (see for example Martin Luther, Von der Freiheit eines Christenmenschen (The

Freedom of a Christian), Wittenberg 1520), or as Marshall McLuhan put it, printing brought not simply a change in literature, but a change in consciousness itself (The Gutenberg Galaxy, 1962, p35).

[2] To my knowledge, this term has been coined, or at least first systematically explored by Manuel Castells, The Informational City: Information Technology. Economic Restructuring and the Urban-Regional Process, Oxford and Cambridge 1989. See also Castells 1993 and 1994 as well as María Elena Martínez Torres, Lucha ‘posmoderna' de los desposeidos de la moderinidad, (Post-modern Struggle by the Dispossessed of Modernity), Sincronía, Fall 1997. (Available at http://fuentes.csh.udgm̩x/CUCSH/Sincronia/torres.htm).

[3] For a discussion of institutional challenges brought about by the rise of Humanities Computing to a new field of scholarly activities, see the paper “We would know how we know what we know: Responding to the computational transformation of the humanities” by Willard McCarty, presented at The Transformation of Science: Research between Printed Information and the Challenges of Electronic Networks. Max Planck Gesellschaft, Schloss Elmau, 31 May-2 June 1999. Online version at http://ilex.cc.kcl.ac.uk/wlm/essays/know/

[4] First published in Zu Max Plancks sechzigstem Geburtstag. Ansprachen gehalten am 26. April 1918 in der Deutschen Physikalischen Gesellschaft, edited by Emil Warburg. According to The collected papers of Albert Einstein, Vol. 8 (Princeton, 1998) ed. by Robert Schulman et. al, p.1021, the original title of Einstein' s talk was “Planck als wissenschaftliche Persönlichkeit” (Planck as scientific personality), but it was published as “Motive der Forschung” (Motives of Research). It later appeared in Albert Einstein, Mein Weltbild (rev. edition Zürich 1953) pp.141-144 under the heading “Prinzipien der Forschung” (Principles of Research) and was included under the same title in an English compilation Ideas and Opinions (New York 1954) pp. 224-227. This quotation is from the English translation, p. 224f.

[5] In fact scholarly activity is never innocent in more than one sense, as is perhaps best seen in the natural sciences, where research results like the atomic bomb or gene engineering almost immediately yield severe consequences. This is also true for this field and for new developments like

the employment of electronic media for research purposes. It is however far beyond the scope of this article to discuss this issue.

[6] Scholarly Publishing. The Electronic Frontier, edited by Robin P. Peek and Gregory B. Newby, Cambridge, MA 1996.

[7] See Phaedrus, 275-78. According to him, the limitations of the written word are that it can answer no questions, it cannot choose its readers, it gets misunderstood with no means of correcting misunderstanding and it leads man to neglect the praise of the gods. Its one worthwhile function is to remind those who know of what they know. By contrast with this dead discourse live speech can defend itself, and will be uttered or not as appropriate to the potential audience. The only serious use of words is achieved when speech, not writing, is employed by dialecticians to sow seeds of knowledge in the soul of the learner.

[8] Seventh Letter, 341-42.

[9] Some of the learned societies began as early as the 15th century, but the first were devoted to classical scholarship, rather than scientific research. The first scientific academies date from later years, like the Lincei Academy in Rome (founded 1603), the Accademia del Cimento in Florence (founded 1657), the Royal Society of London for the Promotion of Natural Knowledge (founded 1660) and the Académie des Sciences in Paris (1666). C.f. Encyclopedia Britannica (CD-ROM edition 1997), entries academy and Royal Society.

[10] See Robin Peek, “Scholarly Publishing, Facing the New Frontiers”, in: Scholarly publishing, p. 5.

[11] The final aim would of course be to publish the results of the research in a monograph.

[12] One specific example of how peer-review is implemented, in this case by the National Institute of Health (NIH) in the USA, can be found at http://grants.nih.gov/grants/peer/peer.htm. A more elaborate discussion by John Peters can be found at http://www.press.umich.edu/jep/works/PetrHundr.html. Peters especially focuses on the question of how the traditional review process can be moved to the new medium of networked communication.

[13] To give just one recent example, at the XII IABS conference in Lausanne, Aug.23-28. 1999, it was formally announced, that the Journal of the International Association of Buddhist Studies will in future be published simultaneously in paper and electronic form.

[14] For the scholarly use of Internet resources see T. Matthew Ciolek, The Scholarly Uses of the Internet: 1998 Online Survey (last revised 15 Mar 1998) at http://www.ciolek.com/PAPERS/InternetSurvey-98.html.

[15] Many years ago I came across the words “On the Internet nobody knows you are a dog.” It is especially this anonymous character and the immediate communication that creates a new type of exchange hitherto unknown. It is probably for the first time that students doing research on a project can get first-hand advice from specialist in their field.

[16] This is often referred to as netiquette and states how a well behaved netizen (net citizen) should act. With the exponential growth of net users, it has become increasingly difficult to enact these rules.

[17] This has increasingly become a research topic in practical philosophy and related fields. For the theoretical foundations see Jürgen Habermas, Theorie des kommunikativen Handelns, Frankfurt, 1981.

[18] The list-owner is the person who manages the administrative part of the email discussion list. He might also be a moderator, thus taking on the job to filter out unwanted messages in order not to overload the subscribers mailbox.

[19] The best known example is probably BUDDHA-L, started by Richard P. Hayes in 1991. Intended to be a forum for academic exchange in Buddhist Studies, it grew well beyond that and now witnesses rather uninformed discussions on a wide range of Buddhist topics. A similar example is the INDOLOGY@listserv.liv.ac.uk list, established in November 1990, which struggles with similar problems, but still manages to provide useful services to its members.

[20] Date: Fri, 14 May 1999 15:02:12 +0900, private message by Charles Muller. According to him, this message was sent out to more than 200 recipients of information about his electronic resources. Requests for subscriptions may be made to him at acmuller@human.toyogakuen-u.ac.jp.

[21] P. Ginsparg has gone even farther with this sarcastic statement: “In the long term, it is difficult to imagine how the current model of funding publishing companies through research libraries (in turn funded by overhead on research grants) can possibly persist.” See P. Ginsparg, “Winners and Losers in the Global Research Village,” Invited contribution for the conference Electronic Publishing in Science held at UNESCO HQ, Paris, 19-23 Feb.1996, during session Scientist' s View of Electronic Publishing and Issues Raised, Wed 21 Feb 1996. The presentation is electronically available at http://xxx.lanl.gov/blurb/pg96unesco.html.

[22] A detailed analysis of the various arguments on both sides may be found in “The Impact of Electronic Publishing on the Academic Community” by Robert J. Silverman, in: Scholarly Publishing, pp.55-69 and in “Analyzing Alternate Visions of Electronic Publishing and Digital Libraries” by Rob Kling and Roberta Lamb, in: Scholarly Publishing, pp. 17-54.

[23] Access to the JBE is at http://www.psu.edu/jbe/jbe.html.

[24] In his presentation on the Journal of Buddhist Ethics at the XII. Conference of the International Association of Buddhist Studies in Lausanne, August 25th, 1999.

[25] This service has in the meantime been renamed PubMed Central and is the topic of a “Cutting Edge” debate at http://www.biomednet.com/hmsbeagle/61/viewpts/overview. (nota bene: this site is owned by Elsevier publishing.)

[26] See http://wwwṇih.gov/welcome/director/ebiomed/ebiomed.htm.

[27] http://www.nih.gov/welcome/director/ebiomed/com0509.htm
The main site of the physics archive is at http://xxx.lanl.gov.

[28] See note 21 above

[29] This has been done in cooperation with the Los Alamos physics archive and the Networked Computer Science Technical Reference Library (NCSTRL) as CORR at http://www.acm.org/pubs/corr.

[30] Information about the HUMANIST discussion list, a forum of Scholars applying computers in various fields of the Humanities, which has been in operation for more than 12 years now, can be found at http://www.kcl.ac.uk/humanities/cch/humanist.

[31] Humanist Discussion Group, Vol. 13, No. 124. (Aug. 3rd, 1999)

[32] Humanist Discussion Group, Vol. 13, No. 128. (Aug. 4th, 1999)

[33] Humanist Discussion Group, Vol. 13, No. 135. (Aug. 12th, 1999)

[34] The bibliography is accessible at http://ccbsn̩tu.edu.tw and on various mirror sites.

[35] It goes without saying that the term “reader” has to be read cum grano salis and is to include the meanings of listening viewing and other ways of perceiving electronic multimedial resources. The term reading is used to mean not only the process of perceiving the content of the various medial transmitters, but also to put them in context, assign meaning to them.

[36] http://www.ciolek.com/WWWVL-Buddhism.html.

[37] The archives homepage, maintained by Janice M. Glowsky is at http://kaladarshan.arts.ohio-state.edu/anu/buddhart.html.

[38] The dictionary, as well a wealth of other resources is available at http://www.human.toyogakuen-u.ca.jp/~acmuller.

[39] The homepage of the International Dunhuang Project is at http://idp.bl.uk.

[40] Contact person is Dr. Supachai Tangwongsan at ccstw@mahidol.ac.th.

[41] So far only a version for PC compatibles running MS-Windows has been released.

[42] More information on the VRI web-site http://www.vrpa.com/vri/pali-canon-cd.htm.

[43] http://www.freepali.org.

[44] A report of this meeting by Christian Wittern is available at http://www.iijnet.or.jp/iriz/irizhtml/ebti/ haiensa.htm.

[45] A report of the Taipei meeting by Michel Mohr 1996 is available at http://www.iijnet.or.jp/iriz/irizhtml/ebti/taipei.htm.

[46] A report of the Kyoto meeting by A. Charles Muller is available at http://www.human.toyogakuen-u.ac.jp/~acmuller/ ebti/ebti1997report.htm.

[47] The Pacific Neighbourhood Consortium, a non-profit Organization to promote networked ressources and exchange among the countries along the Pacific Rim. For more information, see http://www.pnclink.org.

[48] The Electronic Cultural Atlas Initiative, a very active group of scholars in a stunning variety of disciplines, brought together by Lewis Lancasters vision of arranging and connecting vastly disparate data related to any aspect of human activity culture through geospatial references. For more information see http://www.ecai.org.

[49] Scholars Engaged in Electronic Resources, a lose association of scholars, mostly from Asian or Buddhist Studies, with the aim of increasing the acceptance of digital resources in the mainstream of the respective fields. It was first conceived at the 35th ICANAS meeting in Budapest 1997. More information is available at http://titus.uni-frankfurt.de/seer/index.htm.

[50] A report of the Academia Sinica meeting by A. Charles Muller is available at: http://www.human.toyogakuenu.ac.jp/~acmuller/ebti/ ebti1999report.htm. See also an “unofficial” report by Lou Burnard at: http://users.ox.ac.uk/~lou/reports/9901taipei.htm

[51] The CD-ROM is still available for the cost of mailing it, please look at http://www.iijnet.or.jp/iriz/irizhtml/ irizhome.htm for details.

[52] For a detailed description of the Korean Tripiṭaka please see Lewis Lancaster and Song-bae Park, The Korean Buddhist Canon: A Descriptive Catalogue, Berkeley 1979, especially pp. ix-xvii.

[53] For a review of this CD-ROM see my article “Review of the Tripiṭaka Koreana CD-ROM,” http://www.gwdg.de/~cwitter/info/tkinfo.htm, 29.5.1996.

[54] SAT is the abbreviation of the Sanskrit name of this project, Saṃgaṇikiikṛtaṃ Taiśotripiṭakaṃ, “Digitization of the Taisho Tripiṭaka.” The SAT homepage is at http://www.l.u-tokyo.ac.jp/~sat/index.html.

[55] The CBETA homepage is at http://ccbsɳtu.edu.tw/cbeta.

[56] For more information on these standards see below page 496.

[57] Both projects agreed to use the numbers assigned by the Mojikyo Font Institute (more information available at http://wwwṃojikyo.gr.jp) to represent the characters that are not available in a computers standard repertoire of characters. This private institute also assigns new number on request and creates the fonts necessary for its representation. Other projects have signaled their willingness to use this system, which has thus has the potential to become a solution to the longstanding problem of representing these characters across projects and platforms.

[58] More information is available at http://www.buddhism.org.hk. It has however been difficult to contact this group and order the CD-ROM.

[59] See the ACIP homepage at http://www.asianclassics.org.

[60] One good starting point for a survey of texts in Indic languages is the text archive of the Indology homepage at http://www.ucl.ac.uk/~ucgadkw/indnet-textarchive.html. A good collection of texts are also available at the TITUS (Thesaurus of indogermanic texts and language-materials) homepage at http://titus.uni-frankfurt.de.

[61] See http://www.std.com/~metta. This site features also an excellent introduction to the Pāli Canon and some introductions to Buddhism in the Theravada tradition.

[62] http://www.palikanon.de.

[63] Perl, the Practical Extraction and Report Language (or the Pathologically Eclectic Rubbish Lister) is a computer language designed by Larry Wall, see Larry Wall, Tom Christiansen and Randall Schwarz Programming Perl, Second Edition, Cambridge etc. 1996, p. xi. Perl is especially suited for text processing and widely used on the Internet. More information can be found at http://www.perl.com. If there were any single

computer language be considered by a scholar to enlarge his repertoire, Perl certainly is the best candidate for it, both for its relative ease of learning and its large potential.

[64] These open standards are of course neither new nor encountered only in computing; to the contrary, building complex machines like cars or airplanes would be completely impossible without standards defining common sizes for screws and bolts.

[65] For more information see The SGML Handbook, by Charles Goldfarb, Oxford, 1990. SGML as a basis for development of markup standards has been largely replaced by the much simpler but only marginally less expressive XML (Extended Markup Language), developed by the World Wide Web Consortium and issued as a recommendation in February 1998 (see http://www.w3.org/XML).

[66] Sperberg-McQueen, C. Michael and Burnard, Lou (Eds.) Guidelines for Electronic Text Encoding and Interchange, Chicago and Oxford, 1994, sponsored by the Association for Computers and the Humanities (ACH), the Association for Computational Linguistics (ACL) and the Association of Literary and Linguistic Computing (ALLC).

[67] See for example the methods discussed by Christopher Welty and Nancy Ide in “Using the Right Tools: Enhancing Retrieval from Marked-up Documents,” in: Computers and the Humanities, Vol. 33, Nos. 1-2 April 1999, pp. 59-84.

[68] Thomas A. Phelps and Robert Wilensky, Multivalent Documents. A New Model for Digital Documents, University of California, Berkeley, Technical Report CSD-98-999 (1998). See also Howie Lan, Technical Advances for the Development of Virtual Libraries: The Digital Libraries Initiative (DLI) Projects and A New Document Model, in: Simon Lin (ed.) Proceedings of 1999 EBTI, ECAI, SEER & PNC Joint Meeting January 18-21, 1999, p. 121-129.

[69] This has to be done with the necessary care however. Since many scriptures changed over the time, a passage might have been present in a scripture at the time the quotation was taken. This illustrates the need for a historical dimension in our digital canon of Buddhist scriptures, where texts can be displayed as the tradition at a certain point in time saw them.