

Buddhist Studies and the New Technology

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We are living in a period when a revolution, often hidden but nevertheless real, is transforming scholarly work. This revolution is brought about by the technological advances which have characterized the past three decades of this century, in particular the technology of electronic databases.

This is not the first time that Buddhism has come into contact with technological innovations. It has faced and made use of many in its spread throughout Asia. At first in India, we believe that Buddhist teachings were transmitted orally by reciters who memorized and repeated the words attributed to the founder. The use of writing in India produced a new era; written texts came into existence, manuscripts containing the words previously recited by the teachers. Wherever writing appears, society must search for a surface upon which to put that writing. Often, as was the case for King Aśoka, stone is one of the first places where writing is inscribed. In India, they also found the palm leaf to be a surface that could be easily used for writing. It had many advantages. The leaves were commonly available, they were light in weight and could be cut into standard formats. As primitive as it might sound to us today, this was a form of technological advance, for the use of the palm leaf involved some new methods of industry. Each leaf was cut and either dried before having ink applied or was scratched with a

sharp stylus so that the sap could seep out of the scratch and be covered with soot that would dissolve into the liquid and form a dark mark in the shape of the letters. When fully dried the leaf had a light color and made an excellent background for the black writing. This technology of the leaf moved Buddhism from a religion of oral recitation to a scribal tradition with written texts. The influence on the way in which the religion was to be studied and on the scholarly monastic tradition that developed as a part of this written culture, was profound. It is hard to imagine Buddhism as we know it without the written literature that started with the palm leaf manuscripts.

When Buddhism moved to China, entirely different technology came to be used to preserve and transmit the written teachings. The Chinese had invented the brush, refined the process of making ink, developed silk and paper as superior surfaces for writing. Paper allowed Buddhist texts to be copied and distributed in numbers that had never been known in Indian culture with palm leaves. As early as the fifth century, we have a document from Cave Seventeen at Dunhuang which tells us that one official had paid to have ten sets of all the Buddhist texts copied. We think that at that time, the Buddhist scriptures, which were mainly translations from Sanskrit texts, required more than fourteen hundred scrolls for a complete set. Each scroll was made up of fifteen sheets of paper and thus each set of the scriptures contained over twenty thousand sheets of handmade paper. When we think of ten sets, the amount of paper needed is staggering. But imagine for a moment what such a project would mean if one had to rely on the old Indian technology of palm leaves. It would have taken a forest of palms for just this one donation. Paper that could be made in any quantity was a true revolution for Buddhist studies and much of what we know about early Buddhism is still available to us because of the widespread copy work that was done in China on paper using brush and ink technology.

The next great technology to affect the study of Buddhism came with the development of printing blocks. These printing blocks were carved in the reverse, so that rubbings from them would be right side up. Prior to printing with this type of block, the Chinese had made a few copies of Buddhist materials by using stamps, that is wooden plates that could be pushed down on the surface of the paper to make an impression. True printing, for large numbers of copies, could only be practical after the development of the blocks which were carved in reverse, blocks which could be used by putting ink on the wooden surface and then placing a sheet of paper on the block, making an impression by gently pressing and rubbing the paper against the inked surface. This technology of printing reached a high point in the tenth century when the Northern Sung court ordered the officials in Chengdu in Sichuan

Province to make a complete set of printing blocks for the Buddhist canon. As a result of this order 130,000 blocks were made and rubbings from them were sent to Japan, Kōryō, the Liao kingdom of the Khitans, and the Jurchen court. For centuries this technology of printing from blocks dominated the way in which Buddhist texts were copied and transmitted.

Even in the nineteenth and twentieth centuries when the newer method of movable metal type was employed for making copies of the Buddhist canon, the technology was still that of printing. It was the printing technology that made it possible for the large Buddhist canon to appear in several versions and to be widely distributed.

Up to the present time, we can say that the dissemination and spread of Buddhist texts has happened within two eras, the first being that of the handwritten manuscript and the second typological. The study of Buddhism and the development of scholastic traditions within the religion were profoundly affected by each of these two technological eras. During the manuscript period, the major task of the scribe was to preserve the text and the information it contained. This was especially true for the Indian environment, where palm leaves were fragile and subject to decay and insect damage. The process of recopying was necessary to keep at least one copy of the material in existence. Because the palm leaf manuscripts were easily damaged, their use had to be controlled. Every reading shortened the life of the copy and permission to make use of the copy was only given in special circumstances. The copy was seen not as a source for research and reading but as a master copy needed for future copies.

Printing changed scholarship in crucial ways. Multiple copies of a text could be made, copies that were identical in every respect. These copies could be distributed widely and since new copies were readily made from the printing blocks, books could be used without fear of destroying the master copy. Since individuals over a wide area were all looking at the same copy, it became possible for scholars to produce commentaries and treatises with the full awareness that many others had access to the same text. The Manuscript Era gave us such things as a page, paragraphs, chapters, even space between words. The Typological Era with its multiple copies brought into being the numbering of sequential pages, indices and bibliography. Since printing brought about an increase in the number of texts available, it was necessary to devise ways of having access to these books and the tools for doing this, pagination, indexing and referencing constitute a major task of the scholarly community even in our contemporary world.

For more than a thousand years, Buddhist studies in East Asia has been based on printed books and this has largely determined the na-

ture of our scholarship. During this present decade we face for the first time in centuries a new technology which is going to bring a change in our scholarship as dramatic as that which occurred with the invention of printing. These last few years of the twentieth century will be dominated by the development of electronic databases. Just as the Chinese in the tenth century made a great step in carving printing blocks, so now we make the step of putting the Buddhist teachings into our computers. Instead of having wooden blocks that occupy large storage halls, or stacks of palm leaves on shelves, we will come to depend on the invisible electronic memory for our copies of the Buddhist canon. This invisibility of the text has caused one author to say that the electronic memory is not on a human scale. It removes us from the tactile process of handling or feeling the paper. When we work with the words on the screen of the computer, we are not always aware that these words are only one level of the storage of what we write, that behind the screen there are several layers of technology occurring, to make possible our writing.

Electronic data will change our ways of scholarship, since it permits us to make full text searches, concordances and uses of the material that will bring to our attention new types of questions and innovations regarding learning. This has yet to be understood fully by our scholarly community. Recently, a major university did massive input of textual data into digital form, fully machine readable. The support for this project came because the scholars wanted an aid for making a full concordance of the material. Using the printouts they are publishing a multivolume concordance at great cost to themselves and the users. The irony of this has not yet been noticed; there is no need for the printed concordance since every word can be searched within seconds by a simple software retrieval program. These survivals of the era when we were limited to printed books and relied on concordances, indices and the like for access to the many volumes on our shelves, will soon pass out of existence. Libraries will prefer the database itself, will provide the search software, will not want to use resources to house paper copies of such concordances for a hundred years or more.

This is not to say that books are going to disappear. In fact, computers are increasing the volume of publication. For a time, increased printing of books, using the laser printer and the desk top publishing programs, will provide us with a new method for having cheaper copies of printed matter. However, there is a new factor in current publication. Nearly all of our printed materials today are being reproduced from electronic memory and as readers become more interested in having electronically linked texts, they will prefer to have the databases for use, rather than the paper copy. As this occurs over the coming years, the printed book will, at the least, lose its primary place in scholarship.

How will this electronic era change Buddhist scholarship? The history of the impact of printed books in China and in Europe is becoming better known as researchers note the changes that started with the periods when multiple copies of books became available. When we consider some of these changes and the importance of them for the past, the impact of electronic publication must be seen as an agent of change with a similar potential for bringing about whole new methods of study. When books became easily available, one of the first shifts in learning was the weakening of the power of a few classics which had previously dominated intellectual life. Easy publication of books in Asia and Europe allowed people to write documents in the vernacular languages understood by ordinary people. By contrast, the books in ancient languages controlled by a group of learned scholars lost some of their importance and prestige. In Europe, the study of the scripture of Christianity was profoundly affected by the appearance of several printed versions of the Bible. The idea that every word of the Bible was divinely inspired, including the English translation, was in part destroyed by the presence of these multiple versions where people had come to believe in the existence of only one. Some similar questions were faced in Tokyo in the nineteenth century when the decision was made to print the Chinese Buddhist canon. The leaders of the project had before them rubbings from the printing blocks of Korea, prints from the Sung, Yuan and Ming dynasties, as well as manuscripts from ancient times in Japan. Multiple versions of the Buddhist canon created problems and questions and required scholars to deal with the fact that changes have occurred over the centuries in even the most sacred of texts.

One of the concepts which changes as technology undergoes new development, is that of authorship. During the Manuscript Era, becoming an author was fairly simple. Anyone who could write and had a surface on which to do it, could sit down and become an author within a few hours or days. The judgment of the importance of one manuscript over many others was rendered on the basis of the number of copies that were made and whether the text became widely known and used. Printing brought about a new notion of authorship. It is expensive to print a volume and only a few can have their work presented to the public in this form. Since the book represents an investment of money, the idea of intellectual property became important for books, and copy rights were a way to protect this property and the one who owned it either by right of authorship or publication. In Buddhist studies, as in most of humanistic studies, we have treasured the independence of each author and the rights they hold with regard to their printed words. We carefully preserve recognition of these rights of ownership through such devices as footnotes and citations. We hold to the notion of the creativ-

ity and originality of the author. These are aspects of scholarship which have been fostered in large measure by the technology of printing.

Our idea of authorship in Buddhist studies will undergo radical changes as we begin to shift from printing to electronic memory. Since networking of material will become the norm in the future publication patterns, the emphasis will shift from individual authorship to collaboration. In scientific writing, this move toward multiple authorship has long been accepted. A scientific journal article can have ten or more names listed as authors. The very act of networking, that is to put one's ideas into a form that can be accessed by a large number of people, who can in turn add their own comments, erodes the concept of authorship held in Buddhist studies. Foucault, one of the chief philosophers of the present time, has said "We can easily imagine a culture where discourse would circulate without any need of an author."

Electronic technology not only changes the ideas of reader and author, it will challenge our accepted ideas about the role of the teacher, the skills that need to be acquired by students and the structure of the educational institutions. Having access to electronically linked texts with sophisticated modes of retrieval of information will empower students and they will have the opportunity for more self direction. In the future, students must be trained to create their own pathways through the information stored in the databases. This ability to move about within memory banks that contain tens of thousands of pages of material will be one of the major intellectual tasks for students. They must learn to determine methods of accessing, sequencing and deriving meaning from the retrieval process. In the past, and it is still the case at the present for many fields in humanistic studies, a learned mentor provided guidance not only through the use of printed scholarly tools but also from a lifetime of reading and personal contact with all texts considered to be of importance. For most of us, whatever skills we possess regarding the sequence and meaning of our study are in large part due to experience. How different is the situation where students can find every reference to a term in a large body of data and can quickly store the information while turning, perhaps in the same day, to a second and third term. With this power at their fingertips, students will develop patterns of research in which the older tools of scholarship will be diminished and in due course superseded by the new technology. As one scholar has stated, hypertext electronic systems should be viewed as learning tools and not as teaching tools. The databases provide an environment where discovery learning will flourish. Even a first time user of a retrieval system tied to a large body of linked texts can discover something which has never been noted by previous research.

Today students at major institutions have available a vast array of millions of pages of data in the library. But having it available and being able to have it accessible are quite different situations. When we have millions of pages of data in electronic form, our learning must be directed toward ways of helping students acquire the habit of observing how a variety of causal elements impact a single event. The Buddha long ago taught that all things are present within the stream of cause and conditions, that the world is like the net of Indra, every facet related to and reflected in all others. I think the Buddha would have looked at the linked texts of the computer database, the power to search for the reflection of any aspect of life in a multitude of places, and would have had no reservations. It might well appear to him to be another *upāya*, skill in teaching, a way of discovering more completely the real nature of the interdependent and causal network that we refer to as "life."

Students in colleges and universities all over the world take courses which have content that is not seen as being related to the content of other courses. Sociology and accounting are so different that as students move from one class to another, they sense no connection. This provides, as one educator has pointed out, a "sense of education as a set of fragmented, unrelated experiences." Thus, when we teach Buddhist studies, it is all too often completely separated from the other content of the rest of the university curriculum. One of the promises of hypertext electronic systems is the ability to search across the boundaries of disciplines and subject matter and to perceive relationships between courses. It should be possible for a student in economics involved with the study of wealth and what are considered to be valuable commodities, to search for those very terms within Buddhist texts. Buddhism helped to define wealth and the value of precious objects in Asia, but it is difficult to make use of this role of the religion without technology that allows us to make connections and seek for answers with some ease. When a document is placed in this electronic environment, it no longer exists alone, like a single book on a shelf. It exists in relationship to other documents included in the database in a way that books on a shelf can never duplicate. For in the database, the documents can be accessed by any number of retrieval systems, can be used for notes in any order and every document is linked to all others.

When we finally have the Chinese, Pali, and Tibetan Buddhist canons in machine readable form (and that time is rapidly approaching), these databases will be available not only to senior Buddhist scholars or students in the field, they will be open to specialists from all other disciplines. Scholars of Chinese classical literature will be able to ac-

cess Buddhist materials to search out phrases, ideas, terms, and in so doing they will make use of the canonic texts in ways that are not now part of our study of Buddhism. All that will be required for this search will be the ability to make use of the retrieval software for reading the Buddhist canon for specific references. Our clearly delineated disciplines will tend to become more interdependent. As access to the data of other fields becomes easier, Buddhist material will become more important to other disciplines of study, and on the Buddhist side, our scholars will be more apt to turn their attention to similar problems and developments in a number of areas which are now left untouched. This has implications for the study of the documents which are marginal, texts that are not included in the standard Buddhist canons found in research libraries. In the hypertext world, the existence of these materials in machine readable form will give them equal footing to all other Buddhist texts.

It has been our karma to be living at a time when technology brings about enormous and far reaching changes in the way in which our descendants will study and learn. The willingness of the present generation to enter into this enterprise and the ability of institutions of learning to respond to the challenge of the new technology will have lasting effects on the way in which the future students will be educated. I have offered you a very small view of a large issue. It is a difficult one to discuss because part of the vision I have presented is of a future that most of us will not experience. To ignore the potential of the electronic age for Buddhist studies is quite possible, to stop its impact on the present and future scholarship is quite impossible. Whatever the future for this field, for higher education, we can say with assurance that it will mean the destruction of some of the current ways of doing our job and the creation of new avenues of learning which we can look forward to with the keenest anticipation.