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"Potentials of New Media for Education," *ISA News 2004*, Geneva (in press).

In Europe and North America everyone is aware that computers are affecting education. Very few are aware of the full scope of the changes at hand. In Denmark there are predictions that 100% of the population will have Internet access and cell phones by 2008. Many speak of Information and Communication Technologies (ICT). In fact, the gradual subsumption of telephony, and television to digital Internet technologies means that it is more accurate to speak of Universal Convergence Technologies (a shift from ICT to UCT).

When the Internet began in 1968 it was an experiment connecting a handful of scientists first in Britain then in the United States. The advent of the World Wide Web (1989) soon transformed a predominantly English language user group of just over 100,000 to 200 million by 2000 and 800 million multilingual users in 2004. English is now approximately 1/3 the Internet, Chinese accounts for 16% and is predicted to become the most used language within the next few years.

One consequence of these trends is an enormous expansion in the range of so-called multimedia technologies. It is predicted that Virtual Reality and Augmented Reality techniques will make their way into the mainstream of elementary and high school teaching by the year 2020, allowing children to go on fly-throughs of reconstructions of dinosaur parks, chemical combinations and historical buildings such as the Parthenon.[1] This calls for a whole range of new critical methods. Already today, augmented reality is being used in medical training and even in real-time surgery; in the training of naval personnel and digital avatars are helping in the training of new astronauts.

September 2004 saw a new development in this context. Researchers at the Bauhaus in Germany combined real time video of regular cell phones (physical world) with three dimensional design models (possible worlds).[2] This means we can impose virtual reconstructions of old ruins onto actual ruins as has already been demonstrated in the EU Archeoguide project. Potentially it points to much more. The camera of a cell phone, Personal Digital Assistant (PDA) or a portable computer could theoretically photograph the physical world (animals, minerals, vegetables), resulting in digital images which are compared with their equivalents in online databases, thus allowing a traveller or student to identify plants and animals on location as they travel or explore. This would transform the notion of field trips as we know them today, the way we approach nature and indeed the way we handle enduring knowledge. To offer a very elementary example: amateur mushroom enthusiasts would no longer need to carry big books to help them identify which species are poisonous. Their cell phones would connect via a virtual reference room to digital libraries that answered this question. Theoretically real time DNA testing would also be an option.

In the past, historical evidence was typically in museums and archives, published work was in libraries experimental evidence was in laboratories, research was typically stored in professors' notes or specialized databases. Increasingly these disparate kinds of knowledge are becoming interconnected in a single seamless framework. One example is the Molecular Interactive Collaborative Environment (MICE)[3] in San Diego that combines distributed descriptions and structures of molecules to create digital scenes "on the fly." MICE also provides access to morphology, models, experimental data, and bibliographic data and other databases through a common interface.

Traditional books and articles were judged on the basis of their footnotes, references and bibliographies, which led readers to sources beyond the covers of the work at hand. These sources were often inaccessible to all but a few readers who had access to one of the great research libraries (e.g. London, Paris, Washington). Digital media open many new possibilities. Instead of merely citing a source, they can link directly with the full contents of the work at hand. A concrete example is an announcement in September 2004 by the Joint Information Systems Committee (JISC) in the United Kingdom that over 275,000 Early English Books (effectively all books published in Britain between 1473 and 1700) will be available in full text.[4] Within the next century it is feasible that digital access to the whole of human knowledge will become a reality. This will add an entirely new dimension to the humanist quest for a return to sources (*ad fontes*).

In the past access to knowledge was limited to scholars in major centres. As a result of Internet and UCT, persons all over the world in large centres and small villages can have these new levels of access to knowledge and information. This is important but actually only a first step in a much larger revolution revolution that concerns a new contextualisation of knowledge.

Four trends relating to this contextualisation can be noted. First, the new technologies offer new methods for internal analysis of objects and texts. In the case of paintings for instance, art history is no longer just about the surface visible to the naked eye, it extends to include visible light, Ultra Violet (UV) Flourescence, Infra-Red (IR) photography in pseudo coulours, Infra-Red (IR) Reflectography and X-Radiography.[5]

Second, they are leading to new possibilities concerning external analyses. Two examples will serve to make this point. First, in Assyria, Egypt and other parts of the Near East, the tree of life became associated with the palm tree. This idea was taken up by the Benedictines who made the palm tree of life into an architectural motif in their chapter houses. The idea was developed by the Cistercians, was then propagated by Abbot Suger, developed in Britain before returning to the Continent and gradually became a central theme in Gothic art. Historians of Gothic architecture, influenced also by national traditions, called these various versions of the same tree by very different names: palm tree, Decorated Gothic, Perpendicular Style, Umbrella Form, Fan Shaped Vaulting. It is not until we have systematic access to the external evidence that we are able to see the connections between developments in France, Britain, Germany and the Iberian peninsula in new ways. Our second example is more modern. There are over 70 books on the paintings of Monet, one of the fathers of the Impressionist movement. Many show one or

even several paintings of the Japanese bridge at his country home West of Paris at Giverny. In fact he painted at least 25 examples, which can be seen in digital form. Once we see this complete set in context, we are able to recognize how one of the great masters of realism also becomes one of the fathers of so-called non-realist modern art, not through a rejection of nature but rather through a deep study thereof, not unlike the early 20th century physicists whose deep study of physical matter led them unexpectedly into a study of fields, forces and many subjective dimensions of reality.

A third trend, which also relates to the new technologies outlined in the first trend above, entails new approaches to restoration, whereby researchers can simulate interventions before they actually attempt to carry them out on unique cultural artefacts. The rise of online databases means that a history of such interventions, once the domain of a small clique of restorers and conservators will increasingly become an important dimension of evidence in studying cultural artefacts. If we are to attempt to judge the meaning and significance of an object we need to be able to trace how it has changed over time. Looking at the remains of Leonardo's *Last Supper* today in isolation is not enough to appreciate the significance or even the quality of the original painting.

A fourth trend entails reconstructions. The 19th century set out to determine how things actually happened: Ranke's quest to find "*wie es eigentlich geschehen*." The 20th century pointed to the importance of deconstruction. More recently digital technologies are giving new significance to reconstruction. Instead of claiming solemnly that a now ruined or no longer extant building was necessarily this or that, there are now a number of reconstructions to offer parallel suggestions as to how it may have appeared. New methodologies which link such claims with existing archaeological and historical evidence are only slowly beginning to emerge but will clearly become an important dimension of future scholarship the results of which will gradually trickle down into high school and elementary school classrooms. At a global level this points to new links between physical (archaeological) sites, objects from those sites, which are often in museums, and knowledge about those sites and objects, which is traditionally in libraries and archives.

Sceptics say that these developments are wonderful but are destined only for the developed world rather than the billions of persons in poorer countries where robust telecom and Internet infrastructures are lacking. These sceptics complain of a digital divide. It is important to note that unlike the advent of literacy, which necessarily created a literacy divide between those who could read and those who could not, the trend from ICT to UCT introduces unexpected new possibilities.

Once knowledge and information are in digital form they can readily be translated from one medium to another. Hence a spoken conversation on a telephone can be translated automatically into a digital text—the generation old ideal of automatic dictation—and conversely. In April 2004, India produced a Simple Computer (Simputer) specifically designed for illiterate persons. The device costs around $200 and the price could readily fall to the $10-$20 range within five years. If such devices were linked with Noah Samara's vision of connecting 4 billion persons in South America, Africa and Asia via

satellite and his Worldspace radio, then the enormous potentials of the new media can be expanded into a new vision that literally affects everyone.
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Notes
[1] Diana Walczak, “Encompassing Education.” See: http://www.kurzweilai.net/articles/art0519.html?printable=1.
[2] Eric Smalley, “Cell phone melds video and data,” Technology Research News, August 11/18, 2004. See: http://www.trnmag.com/Stories/2004/081104/Cell_phone_melds_video_and_data_081104.html.
[3] On MICE see: http://mice.sdsc.edu/
[4] Early English Books Online : The Holy Grail of Online Resources?, JISC, 2 Sept 2004. See: http://www.jisc.ac.uk/index.cfm?name=news_eebo. This will be for a licence fee between £78 and £2200 per institution depending on the number of students.
[5] Cf. Editech, Florence. See: http://www.editech.com/uk/html/adorazione-01.html