Pen2Paper

Now You See Me, Now You Don't

A History of Erasing

For as long as there has been writing there have been errors and the need to erase them. Logically, the erasure of writing can be done in one of three ways: namely the removal of the writing from the page, the hiding of the words on the page, and lastly the covering of the words on the page.

The first writing implements and surfaces were made for mistakes, as the wet clay used in tablets could simply be smoothed over and new letters formed with the stylus. It is likely that the complexity of the glyphs used in the first written languages seen in Egypt and Sumer (now in southern Iraq) resulted in many mistakes being made as each glyph would be formed individually. It is estimated that Sumerian cuneiform had approximately 1000 different glyphs in its infancy with its instruction being the main focus of lessons in the very first schools that began in Sumer.

Cuneiform script

The Sumerians established tablet houses that were located in the courtyard of the city temple and its pupils were boys from the wealthiest families. These educational establishments were so named because of the clay tablets upon which lessons were carefully copied from one half to the other by pupils. The learning and recitation of these texts was the primary focus of the school day and upon completion of their education, pupils were employed as scribes.

Editing on Papyrus

The transition from clay tablets to papyrus is significant not only in terms of its transportability, but also its cost and availability, both of which had implications for the writer's ability to make and correct errors. Papyrus is made from the pulp found within the papyrus plant which is native to Egypt and the Mediterranean and was first produced approximately 5000 years ago. The oldest known example of papyrus was discovered in 2012 in an ancient Egyptian harbour located on the Red Sea coast, and has been dated from ca.2560 BC.

The papyrus plants grown in Egypt were the most suited to paper production as their thick stems yielded the most pith. Thin strips of the pulp were cut and laid in overlapping columns to form a page. A second layer of strips would be added in rows and the two layers would be pressed and dried in the sun.

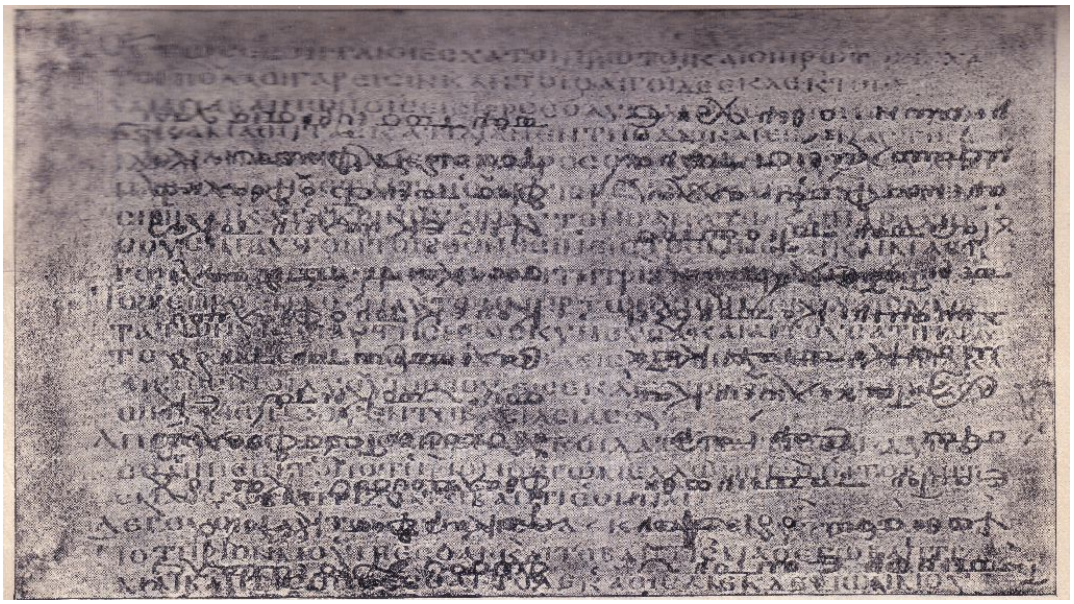
Papyrus being cut

The vast amount of papyrus plants in Egypt meant that is was an inexpensive writing material that did not require reuse as it was so cheap to replace. Any errors made whilst the scribe was writing could simply be washed away with water or scraped away with stone if the ink had dried. The surface of the papyrus page was partly impermeable to the ink as a result of a barrier formed by the drying of the natural residues contained within the papyrus plant.

Editing with Parchment

A rivalry over the rapidly expanding libraries in Alexandria and Bergama led to the development of a writing surface made from animal skins, known as parchment in the 3rd Century BC. It is understood that the Egyptian king banned the export of papyrus to Pergamon (in Asia Minor) as he did not want his library in Alexandria to be surpassed by the library at Bergama.

Whilst parchment was far more expensive to produce than papyrus, it had the advantage of being far more durable and therefore was often washed or scraped clean of ink to create a *palimpsest,* that is, a manuscript page that has been reused.



A palimpsest

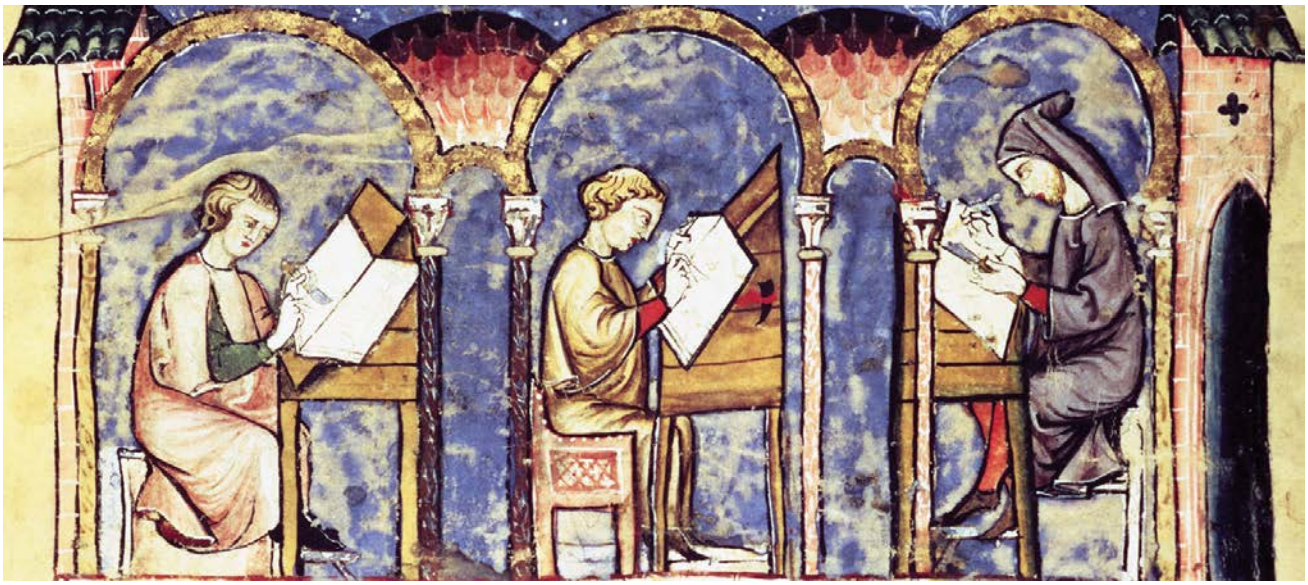
In the early Middle Ages (5th to 10th Century AD) the removal of ink from parchment would be completed with a solution of milk mixed with oat bran. Over time, the original ink would begin to reappear faintly underneath the new writing which has enabled modern scholars to decipher their original contents. One famous example of a palimpsest was located in the early 19th Century in the library of Verona Cathedral where letters written by St Jerome and Gennadius covered the *Institutes of Gaius* which is considered the first student's textbook on Roman law. A more effective technique was later developed which used powdered pumice to scrap the surface of the parchment which permanently removed the ink it had once held.

Striving for Accuracy in the Scriptorium

The early Middle Ages also saw the emergence of the scriptorium, an area within a monastery set aside for the reproduction, conservation and protection of written texts.

This process of manuscript copying which continued in some form until the development of the printing press in the 15th Century might appear to be a process rife with opportunities for errors to occur. In reality, monks would often study the texts that they were to copy extensively before the process of transcription began. In many cases learning the text by heart:

> "[E]ach Psalm would have to be recited at least once a week all through the period of study. In turn, each Psalm studied separately would have to be read slowly and prayerfully…. the process of study would have to continue until virtually everything in the commentary has been absorbed by the student."[i]



A scriptorium

Within the monastic community, the invention of the printing press in the 15th Century led to genuine concern that readers would be at the mercy of the machinist operating the press and so all manner of inconsistencies could appear in the texts as opposed to the regulatory uniform approach of texts produced in the scriptoria. Trithemius, a 15th Century monk explained:

> "However well we behave, however fruitfully we teach, all that would be lost to oblivion if the work of the scribe did not record them in letters. It is scribes who lend strength to words, memory to things, vigour to time….. The printed book is a thing of paper and in a short time will decay entirely."[ii]

The printed book and the widespread usage of wood fibre paper became the springboard for literacy amongst ordinary people in Europe who were now able to access reading material with relative ease. The skill of reading was commonly passed from one generation to the next, regardless of whether formal education was available. The ability to write however remained reserved for those wealthy enough to afford schooling until compulsory education was introduced in England in 1880.

As writing materials became more commonplace in homes and places of work, the need for implements to correct written mistakes became apparent.

Pencil Eraser

The graphite used in pencils was first discovered in Keswick, England in 1564 and it was soon developed as a writing implement by the locals who wrapped it in string to prevent the blackening of their hands. Early pencil marks were erased using breadcrumbs until the French scientist and explorer, Charles Marie de la Condamine brought 'Indian' rubber back from his explorations in South America where it was used by tribes as an adhesive. Small cubes of this rubber began to be used to erase pencil marks to great effect as the famous scientist and discoverer of oxygen, Sir Joseph Priestley observed in 1770:

> "I have seen a substance excellently adapted to the purpose of wiping from paper the mark of black lead pencil".[iii]

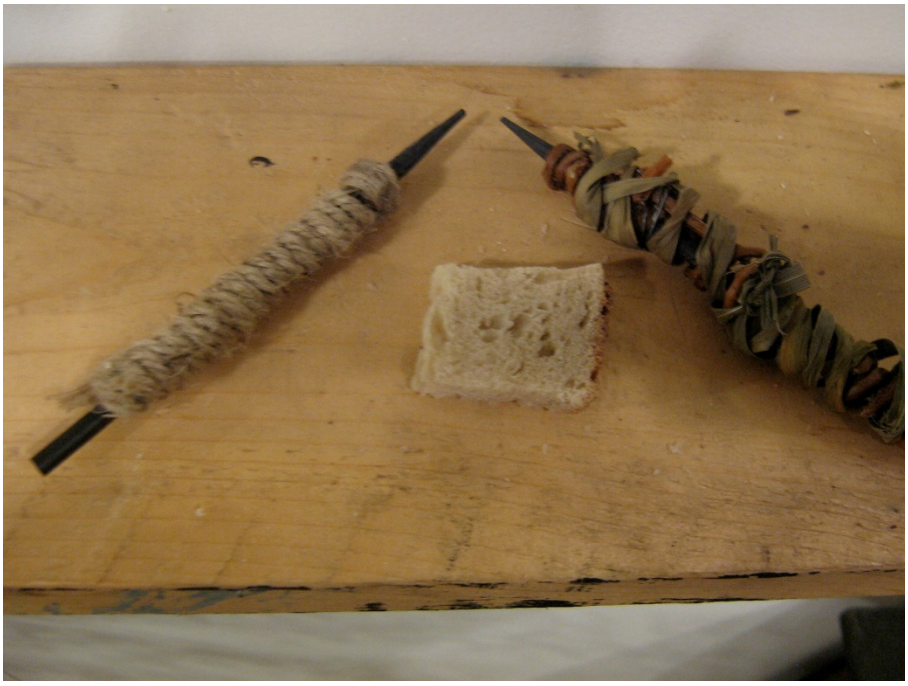


Image of an early pencil and eraser

Whilst rubber proved effective at removing pencil marks it rotted easily and so it was not until Charles Goodyear discovered the process for vulcanising rubber in 1839, that erasers became popular. A patent was issued in 1858 to a Philadelphia man, Hyman Lipman who attached an eraser to the end of a pencil. This patent was not long lasting however as it was decided that this was not a new product but a combination of two existing ones.

The science behind the pencil eraser is simple – the 'stickiness' of the eraser's molecules is greater than that of the paper's molecules and therefore the graphite marks made by the pencil are lifted from the page.

Modern pencil erasers are made from a range of materials including plastic and foam. The last decade has seen the invention of the electric pencil eraser which features a very small disc which gently buffs the pencil marks from the page in a technique reminiscent of the palimpsest process but for the technological age.

Ink Scraper

The removal of ink from paper without damage posed a greater challenge than the lifting of graphite marks left by a pencil. This difficulty was overcome in the Victoria era with the invention of the ink scraper which was a fine pointed and very sharp metal tool used to carefully scrape the ink from the page when mistakes were made.

These tools, like the penknife before them, often became impromptu weapons as they would be carried about the person just as the quill or fountain pen might be. An article in the New York Times from June 1886 recalls the death of a coachman at the hands of a bookkeeper, armed with a steel ink eraser, in a saloon owned by a Mr Bang who testified:

> "A moment later, I heard Flanagan shout, 'Chase that man; he has stabbed me.' I opened the door and saw Flanagan leaning against the wall and bleeding. As I went into the hall he pulled some kind of blade out of his left breast." [iv]

A Victorian ink scraper

In addition to intentional harm, an ink scraper posed a threat to any person who carried one as was seen in 1909 when a young office worker from New York was killed on his fifteenth birthday as he tried to escape the kisses of some female stenographers and fell onto his ink scraper. The headline of the article in the New York Times read:

"Stabbed to Death in Office Frolic
15 Year Old Boy, Struggling with Girl Stenographers
Killed on Birthday
FELL ON SHARP INK ERASER
The Girls in His Department of the Metropolitan Insurance Co Were Trying to Kiss Him – One Arrested."[v]

Mechanical vs Human Error – the Birth of the 'Typo'

The invention of the typewriter in the 1860s led to the dawning of a new era in 'written' mistakes. No longer was it the case that only human ignorance could be the cause of a mistake in text, an involuntary movement of a finger could result in a misspelt word and even the most experienced typist required a method of removing such errors.

The concept of covering up mistakes made in ink began with the typewriter. A German company in the late 1950s developed a correcting tape for the typewriter which could be placed over the incorrect letter and in front of the

ribbon. By retyping this letter, it would be covered in a dry white substance that obscured the letter. Despite being a laborious process, Tipp-Ex (from the German and Latin meaning 'type no more') was an instant success.

The launch of the IBM Correcting Selectric II typewriter in 1973 saw a new technique for the correction of typed mistakes. The ink ribbon was known as a Correctable Film ribbon which contained a pigment that could be easily removed with a correcting ribbon which featured an adhesive 'Lift-Off' tape.

The IBM Selectric II typewriter

Correction fluid

Whilst the correcting tapes were effective, Bette Graham, an American secretary and artist sought an easier solution to typed errors and created a thin white paint that could be applied with a fine watercolour brush to errors on a typed page. Her colleagues were amazed by its results and in 1955 she began to market her liquid as 'Mistake Out', a typewriter correction fluid.

By 1965 a correcting fluid was created by the Tipp-Ex Company allowing handwritten as well as typed errors to be covered over. The last stage in this evolutionary process was the development of the Tipp-Ex mouse in 1995. This was a small dispenser containing a dry tape that could be placed across written text in need of correction. The advantage of this was its accuracy and the fact that it could be written over instantly. Whilst several companies manufactured correctional fluids, Tipp Ex remained the brand leader and is now part of the Bic Corporation.

Ink erasers

The modern ink eraser originated in Germany in the 1930s but only found popularity in the 1970s when it was marketed as *Tintinkiller* or ink killer. Rather than removing the ink from the page, it renders it invisible due to a chemical reaction. This process can be reversed when a different form of ink is applied over the same section of text. Whilst school students are often delighted to have a neat way to eradicate and repair their written errors, these serve an important purpose to the teacher who can help students learn from them, and study patterns of errors amongst a class to identify where a teaching point may need more emphasis.

The Autocorrect Generation

The first spell-checking programmes were in use on mainframe computers by the late 1970s and on personal computers in the early 1980s although these were available as a separate package to the word processor. By the middle of the eighties, word processing programmes such as WordPerfect contained built in spell-checking packages.

These early spell-checkers were able to identify words that were incorrectly spelt but did not autocorrect or identify alternative words that could be used in their place.

The Impact of Spell-Checkers on Language

The ability of a spell-checking programme to autocorrect and suggest synonyms for struggling writers has led to a decline in the number of new words entering the English language according to one study carried out by a group of physicists and published in *Scientific Reports* in March 2012.[vi]

The study highlighted that prior to the inception of the spellchecking programmes, writers made autonomous decisions about both the selection and spelling of words. Additionally, they would draw only on their own vocabulary or that found in a thesaurus when seeking an alternative word. Over time, variations in spellings of words, in addition to the breadth of synonyms commonly used have declined. The evidence to support this hypothesis is seen in mathematical analysis of 10 million words in Spanish, Hebrew and English that appear in digital books that were originally published between 1800 and 2008.

This data enabled the team to identify the frequency of words as well as their birth and death – in this case the point at which they were first used in literature and the point at which their usage ceases. As Joel Tenenbaum, one of the authors of the study explains:

> "The evolution of language is governed simply by individual words competing for usage just as companies compete for market share".[vii]

Spell-Checkers and Writing Fluency

If the increased reliance on spell-checking programmes is impacting on the composition of the English language, it is logical to also question its effect on language acquisition and the development of writing in children.

Research published in 2007 in the *British Journal of Educational Psychology* [viii] identified that the fluency of children's writing completed by hand was superior to that produced by word-processing. Whilst it might be assumed that using a keyboard would improve the quality of the children's writing, in the study of 300 primary school children aged between 9 and 11 the keyboarded scripts were as much as two years behind in development to those that the same children wrote by hand.

The specific use of spell-checking programmes in children's writing was further explored in a study carried out by academics at Oxford Brooks University in 2010.[ix] In this study, children completed writing exercises by hand, with a keyboard but without using a spell checking programme, and with a keyboard and spell-checking programme.

The results suggested that children produced the least amount of errors when making use of a keyboard and spell-checking programme. Perhaps the most interesting finding was that the most errors were made when using the keyboard but without use of spell-checking programme suggesting that:

> "…children may 'sub-contract' spelling to the computer when keyboarding (even when no aid is present)."[x]

Editing and Spell-Checkers

Whilst the purpose of spelling and grammar checking technology is to support the editing process, it seems that dependence upon this technology has developed amongst students of all abilities.

Dennis Galletta PhD, a professor of information systems at the Katz Business School in Pittsburgh demonstrated this reliance in a study in 2005.[xi] A group of 33 undergraduates were given a business letter to proofread with half of the group permitted to use a spell-checking programme and the remainder to use their own auditing skills.

Galletta anticipated that those students with the higher SAT scores would be able to use the spell-checker most effectively. The results indicated that without the spell-checker, those with the higher SAT scores made less than half the auditing errors (5) of those with lower SAT scores (12.3) as might be expected. The surprise came for those students who made use of the spell-checker – there was very little difference in the number of auditing errors made by the most able (16) and least able (17) students, but both groups made significantly more errors when using the spell-checker. Galletta explains:

"They trust the computer, and mixed in with laziness, they get a tendency to overlook the final check process where they read their own writing. When there's no spell checker, they seem to be more careful." [xii]

This should be reassuring reading for those concerned that the digital age equates with the end of the handwritten word and autonomy in the editing process. 5000 years of writing and mistake making has led to a vast array of writing instruments and erasing implements for the masking, covering and removal of words all of which still require the uniquely human ability to identify that which is in need of erasure.

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[i] Quotation from J O'Donnell, *Cassiodorus*, 1995 located online at http://faculty.georgetown.edu/jod/texts/cassbook/toc.html also quoted at http://en.wikipedia.org/wiki/Scriptorium

[ii] Trithemius, *De Laude Scriptorum,* 1494, located at http://misc.yarinareth.net/trithemius.html

[iii] Quotation cited in *Pencil and Eraser Trivia* M. Bellis http://inventors.about.com/library/inventors/blpen.htm

[iv] Quotation taken from *Bang Knocked Him Down* published in the New York Times, June 26th 1886 and located online at http://query.nytimes.com/mem/archive-free/pdf?res=9C0CE4DC1438E533A25755C2A9609C94679FD7CF

[v] *Stabbed to death in office frolic – February 16th 1909*
http://query.nytimes.com/gst/abstract.html?res=9C07E5D81031E733A25755C1A9649C946897D6CF

[vi] A Petersen, J Tennebaum, S Havlin & H Stanley, *Statistical Laws Governing Fluctuations in Word Use from Word Birth to Word Death* , August 2011, and located online at https://eprints.imtlucca.it/1131/1/WordGrowthDynamics.pdf

[vii] J Tenenbaum quoted in F Diep's article *Languages Lose Vocab to Science and Spell-Check* published online in March 2012 and located at http://www.technewsdaily.com/5586-languages-lose-vocab-science-spell-check.html

[viii] V Connelly, D Gee & E Walsh *A Comparison of keyboarded and handwritten compositions and the relationship with transcription speed* published in *British Journal of Educational Psychology Volume 77* in June 2007 and located online at http://onlinelibrary.wiley.com/doi/10.1348/000709906X116768/abstract

[ix] K Walter & V Connelly, *The effect of spell-check on the essay quality of primary school children¸* 2010, Oxford Brookes University located online at http://psych.brookes.ac.uk/ewsc/walter2010.pdf

[x] Quotation taken from study cited in endnote ix

[xi] D Galletta et al *Does Spell-Checking Software need a warning label?* Published in 2005 and located online at http://isites.harvard.edu/fs/docs/icb.topic761456.files/p82-galletta%20durcikova%20everard%20jones%20cacm.pdf

[xii] D Galletta quoted in J Sorrentino 's article *Is Spell Check Creating a Generation of Dummies?* First published online in January 2008 and located at http://www.education.com/magazine/article/spell_check/

IMAGE CREDITS

Image of Cuneiform script - http://www.mesopotamia.co.uk/writing/images/cunei.jpg

Image of papyrus being cut - http://tombsofancientegypt.com/pics/niankhkhnum4.jpg

Image of palimpsest - http://upload.wikimedia.org/wikipedia/commons/c/cc/Codex_ephremi.jpg

Image of scriptorium - http://medievalfragments.files.wordpress.com/2013/11/scriptorium.jpg

Image of early pencil and eraser - http://museumofeverydaylife.org/wp-content/uploads/medievil-pencil-bread-eraser1.jpg

Image of ink scraper - http://www.worthpoint.com/worthopedia/victorian-floral-engraved-retractable-463059859

Image of IBM Selectric II typewriter - http://mytypewriter.com/ProductImages/IBM_Selectric_II.JPG

BIBLIOGRAPHY

http://faculty.georgetown.edu/jod/texts/cassbook/toc.html
http://en.wikipedia.org/wiki/Scriptorium
http://misc.yarinareth.net/trithemius.html
http://inventors.about.com/library/inventors/blpen.htm
http://query.nytimes.com/mem/archive-free/pdf?res=9C0CE4DC1438E533A25755C2A9609C94679FD7CF
http://query.nytimes.com/gst/abstract.html?res=9C07E5D81031E733A25755C1A9649C946897D6CF
https://eprints.imtlucca.it/1131/1/WordGrowthDynamics.pdf
http://www.technewsdaily.com/5586-languages-lose-vocab-science-spell-check.html
http://onlinelibrary.wiley.com/doi/10.1348/000709906X116768/abstract
http://psych.brookes.ac.uk/ewsc/walter2010.pdf
http://isites.harvard.edu/fs/docs/icb.topic761456.files/p82-galletta%20durcikova%20everard%20jones%20cacm.pdf
http://www.education.com/magazine/article/spell_check/
http://www.jstor.org/discover/10.2307/1001415?uid=3738032&uid=2&uid=4&sid=21104065085827
http://home.howstuffworks.com/pen5.htm
http://chemistry.about.com/od/chemistryfaqs/f/eraser.htm
http://www.jetpens.com/blog/a-guide-to-erasers/pt/597
http://www.omniglot.com/writing/sumerian.htm
http://havlin.biu.ac.il/Pdf/Predictions_That_Came_True_universal_translator_Science_and_Spell_Check.pdf
http://havlin.biu.ac.il/Pdf/Predictions_That_Came_True_universal_translator_Science_and_Spell_Check.pdf
http://www.stinkyinkshop.co.uk/blog/a-short-history-of-ink/
http://en.wikipedia.org/wiki/IBM_Selectric_typewriter#Correcting_Selectric_II
http://mysteriesofthebible.wordpress.com/2011/12/23/papyrus-paper-from-the-nile/
http://en.wikipedia.org/wiki/Palimpsest

