

Evolution of the Book-

Punctuated Equilibria (PE) as defined by Niles Eldredge and Stephen Jay Gould, is a theory that attempts to explain the patterns found in the fossil record.¹ As such it explains how the pattern changes with the abrupt appearance of new species...and notes the pattern of extinction of species.² In short, PE is a change of form not process. In his book, *Evolution of the Book*, Frederick Kilgore uses the PE theory to help explain how the book has evolved.³

I agree with Frederick Kilgour's use of PE as an appropriate analogy for discussions into the evolution of the book, but I disagree with his seven punctuations and think they should be adjusted down to the four forms of the book: tablet, roll, codex, and electronic 'Kindle'.⁴ Each form of the book can be seen to have more than one process in producing the book form and as such each process should be addressed. The tablet has the clay and wooden or wax processes; the roll has papyrus, parchment, silk, and paper. The codex has papyrus, parchment, and paper as materials, but also has significant changes in production via hand printing, steam printing, and offset printing. Kilgour includes the changes in production of the codex as 'punctuated equilibria' even though the final form of the codex has not changed significantly enough to be considered a punctuated equilibria according to the PE theory.

Kilgour expounds advancements in the form of the book via a list of items necessary for such a change of PE to occur. These items are called the 'five concurrent elements' and include: societal need for information, technological knowledge and experience, organizational experience and capability, the capability of integrating a new form into existing information systems, and economic viability.⁵

The five concurrent elements can be seen coming together in what Kilgour presents as the first punctuated equilibria, the clay tablet of the Mesopotamia in 2500BC. The societal need of this time period is that of a 'booming' economy that needs administrative record keeping to track payment and work rendered accounts. The technology in use is based on the clay found throughout the region that was used for many building projects and was easily assimilated into a writing surface that could be used in a soft state or fixed permanently.

The organizational experience and capability can be seen in the remains of store rooms or archives for the housing the clay tablets. In addition to these rooms, clay tablets have been found that denote the organizational systems used (catalogs) and how individual clay tablets were included as part of larger collections. Kilgour's fourth element: integration of a new form into an existing system can be seen in the evolution of the token system of record keeping into the clay tablet system.⁶ This evolution of form also brought about the first writing system of symbols. Lastly, the economic viability of the clay tablet can be seen in the nature of the raw clay material that was cheap, readily available, easy to use, and it allowed administrative record keeping to become more efficient. The clay tablet remained viable for many years (2500BC to AD100) within and without the region and was used alongside newer technologies until it was totally replaced with the forms of rolls and waxed tablets.

When applying the five elements to the form of the roll, Kilgour starts with the birth place of the papyrus roll in Egypt 2000BC but then merges it with the later history of the papyrus, parchment, and paper rolls in Greece and Rome. He states in one place that papyrus paper is a major PE and in another

that the papyrus roll is a major PE. In keeping with the flow of his earlier presentation of PE with clay tablets, one could assume that he is speaking mainly of the invention of papyrus paper and shifts toward the incorporated form of the papyrus roll or book.

The first element of social need in the PE of the papyrus roll is much the same as it was with the clay tablet; there was an administrative need to keep lots of records concerning the payments of wages and taxes. In addition, the enormous amounts of records also led to the development of a quicker writing style, Hieratic, which incorporated more cursive symbols and less pictorial Hieroglyphic symbols.⁷ The technology required to transform the papyrus plant into papyrus paper was already in place as the plant had been used to create mats from the interwoven strips of the plant that naturally held themselves together. This feature of papyrus also allowed for the creation of the roll where sheets of papyrus were attached to each other to create a long and narrow sheet that was then rolled up for transportation and storage.

The Egyptians also had in place inks of red and black that allowed for advances in organization of written material through the uses of rubrication. Rubrication is the use of the red ink to draw attention to important parts of the material or to separate material from one another to ease reading. Further organization and capabilities show that the Egyptians had schools set up to train scribes and that there was a book trade and archives of papyrus.

The fourth element of integration can be seen from the transition of elaborate hieroglyphics or pictorial symbols painted on or carved in stone to the same with the addition of the more streamlined curvilinear script painted on papyrus. In addition the smoother surface of papyrus allowed for pictorial illustrations that were used to accompany text and as such Egypt is responsible for the first 'picture books.'⁸

The economic viability of papyrus was based on geographic location, much like Mesopotamian clay for Sumerians, papyrus was a native plant for the Egyptian region and did not grow in other parts of the world. Its production was somewhat more difficult than that of making a clay tablet, but the end result was able to hold more information and was quicker to use. Papyrus was used as a writing surface from 2000BC to AD1000. It shared its popularity as a roll material with the invention of parchment in 1600BC. Parchment was easier to produce because it could be made anywhere animals were raised and it started to replace papyrus as a preferred material with the coming of the codex in AD100.⁹ In relation to form, information may have been hard to find within the rolls if not used to reading them whereas the codex eventually allowed for faster access to information. Papyrus was finally phased out with the coming of paper in AD1025; unfortunately much of the Egyptian history written on papyrus has not withstood the ravages of time. Unlike clay tablets which can live through fire and insects, papyrus did not last long outside its native climate.

The codex is brought forth as the third punctuation of equilibria and according to Kilgour, "It has been praised as the most efficient technique in existence for storing and retrieving information."¹⁰ The societal need for the codex, Kilgour expounds, came about from a desire to access information quickly and is attributed to the direct need of information from the Christian religious sect. This and his

assumption that the papyrus roll form did not allow quick access to information contained within are debatable.¹¹

The technology in place for the codex consisted of the earlier mentioned wax tablet or 'polyptych' and papyrus. Wax tablets were used as early as 1300BC and continued to be used until AD1800. There appears to be enough evidence to suggest that the wax tablet be considered an occurrence of PE in its own right. However, Kilgour mentions the wax tablet as an inspiration for the codex and explains as thus: the blend of wooden polyptych (for wooden cover structure) with folded sheets of papyrus (written on both sides) became the codex.¹² Strangely enough, Kilgour goes on to say: "The codex forced the roll book (papyrus) into extinction by the seventh century AD (600's), but the polyptych lived on until the seventeenth century (1600's)."¹³

Organizational experience and capability to handle the codex was already in place, as the Greek development and expansion of a public library system had been in place since 300BC. Booksellers had been in place longer still. The capability of integrating this new form into the existing information system may have taken a longer road than the Christian explanation and Kilgour put forth. The codex as based on the wax tablet would have inherited the use of the tablet as a notebook or 'scrap paper' and would not have replaced the longer standing papyrus roll for works of literature until a much later date when the quality of papyri being produced dropped below existing standards; and 'Islamic' paper became available.¹⁴

The economic viability of the codex is seen in the savings brought about by using both sides of the paper and by the protection the wooden cover offered the pages within. Later on, the information in a codex became very easily accessible but I would not say that it was faster to produce. It was probably faster to write in and it did allow for more information to be stored within than the average papyrus roll. The invention of the codex in AD150 was a major PE, and the codex has remained a stable source of information up until the present day (AD2008). It has gone through changes of production, but essentially is still small enough to fit in one hand and is a combination of outer protective covers with paper inside.

The next PE is what Kilgour refers to as the electronic book. At the time of the publication of *Evolution of the Book* (2000), the electronic book was not yet in existence. Kilgour speculated on what would be necessary for its eventually invention. All five elements necessary have come to pass but one. The societal need for an electronic book came about from the administrative and commercial need to keep track of the enormous amount of records that are generated by the current society.¹⁵ This refers more to the computer than to an actual book, but like papyrus paper before the roll, it is acceptable. The technology needed was not available in AD2000 but is available now in the form of a small reading device that is just as easy to use as a book, called 'Kindle;' and with its accompanying library database that users can place collected electronic works.

The organizational experience and capability of the electronic book is still in its beginning phases, but is providing readers with an updated assortment of both free and purchasable access to information regardless of location. The capability of the electronic book to integrate into existing forms of

information was not address by Kilgour to the extent that it can be address today. The key to this information lies with the wax tablet which I feel needs to be thoroughly reinvestigated. I find it interesting that modern technologies such as the iPod, iPhone (and such), Nintendo DS, and the Kindle all resemble the early wax tablets. These technologies have also included a stylus and are building off earlier blackberrys, PDA's, and even Wacom tablets. It does not seem such a stretch to even suggest that the future of the book will indeed be a combination of the current Kindle with the Nintendo DS and will allow access to information as well as the ability to share information and create information.

The economic viability of the electronic book is most certain, however at present the cost factors of the Kindle device is around \$399.00, the Nintendo DS around \$130.00, and a Wacom Tablet around \$330.00; in addition there are access costs and information costs that are prohibiting growth of this form. Like earlier electronic forms, the prices are always high at first and then come down (the first VCRs were around \$4000.00 and they currently go for about \$50.00 if you can find them). It is hard to predict how the electronic book will affect the future of information and Kilgour points out that artificial intelligence, genetic programming, and intelligent software may have something to do with the 'evolution' of the electronic book, and he may be right.

Concerning the changing role of knowledge and information reflected in the *Evolution of the Book*, there is a focus on how information was written down, collected, and disseminated. Data output in large numbers were gathered into information, the increase in information led to increase in the production of the carriers of information and increases in the speed of said production. Kilgour begins his book in summary of the main element he feels has contributed to the evolution of the book: "Form aside, the major change throughout the entire history of the book has been in the continuous increase in the speed of production: from the days required to handwrite a single copy, to the minutes to machine-print thousands of copies, to the seconds to compose and display texts on an electronic screen." Information does not necessarily mean knowledge, preserved and passed down from one thinker to another. In this regard Kilgour has not said much about knowledge in society beyond what form s of information may have been lost or saved.

Denise A. Wallace

June 19, 2008

Notes---

1. Niles Eldredge and Stephen Jay Gould, "Punctuated Equilibria: An Alternative to Phyletic Gradualism," in *Models in Paleobotany*, ed. T. J. M. Schopf (San Francisco: Freeman Cooper, 1972), 82-115. Reprinted in Niles Eldredge, *Time Frames* (New York: Simon and Schuster, 1985), 193-223.
2. Wesley R. Elsberry, "Punctuated Equilibria", The TalkOrigins Archive: Exploring the Creation/Evolution Controversy, <http://www.talkorigins.org/faqs/punc-eq.html>, accessed June, 17, 2008.
3. Frederick G. Kilgour, *The Evolution of the Book* (New York: Oxford University Press, Inc, 1998).
4. Amazon's Kindle, www.amazon.com, accessed June 19, 2008

5. Frederick G. Kilgour, *The Evolution of the Book* (New York: Oxford University Press, Inc, 1998), 5-6.
6. Frederick G. Kilgour, *The Evolution of the Book* (New York: Oxford University Press, Inc, 1998), 13.
7. Frederick G. Kilgour, *The Evolution of the Book* (New York: Oxford University Press, Inc, 1998), 23.
8. Kurt Weitzman, *Illustrations in Roll and Codex* (Princeton, New Jersey: Princeton University Press, 1970), 68 as quoted in Frederick G. Kilgour, *The Evolution of the Book* (New York: Oxford University Press, Inc, 1998), 28.
9. Frederick G. Kilgour, *The Evolution of the Book* (New York: Oxford University Press, Inc, 1998), 39.
10. Frederick G. Kilgour, *The Evolution of the Book* (New York: Oxford University Press, Inc, 1998), 48.
11. William Shepherd, "Persecution of early Christians and the rise of the codex", William H. Shepherd, Library & Information Science Portfolio, Papers, http://www.valdosta.edu/~whshepherd/pdfs/Shepherd_persecution_and_codex.pdf, accessed June 18, 2008, 4.
12. Frederick G. Kilgour, *The Evolution of the Book* (New York: Oxford University Press, Inc, 1998), 52.
13. Frederick G. Kilgour, *The Evolution of the Book* (New York: Oxford University Press, Inc, 1998), 49.
14. William Shepherd, "Persecution of early Christians and the rise of the codex", William H. Shepherd, Library & Information Science Portfolio, Papers, http://www.valdosta.edu/~whshepherd/pdfs/Shepherd_persecution_and_codex.pdf, accessed June 18, 2008, 3.
15. Frederick G. Kilgour, *The Evolution of the Book* (New York: Oxford University Press, Inc, 1998), 151.
16. Frederick G. Kilgour, *The Evolution of the Book* (New York: Oxford University Press, Inc, 1998), 4.