



How do we record measurements and observations today, and preserve them for future research in 10, 50 or 100 years from now? This is one of the biggest challenges facing scientists in the 21<sup>st</sup> Century.

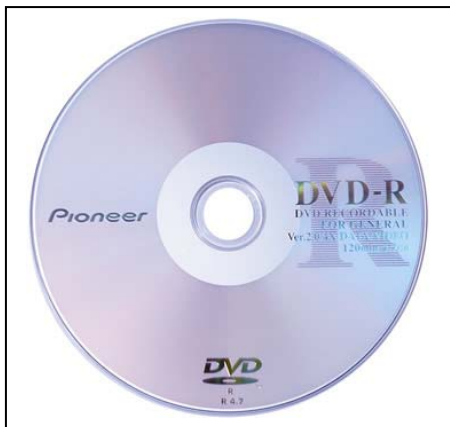
The images to the left show three styles of recording information for posterity. In each case, we can identify: 1) a recording medium, 2) the density of information on the surface, 3) the technology used to write the information, 4) the technology used to read the information, 5) and the technology used to interpret the information.

Each of these five items determines how long the data will remain useful.



**Problem 1** – In the example of Egyptian hieroglyphics (top) ca 2000 BC, assume the complete inscription is 500 characters long, and that each character can be stored in a 1-byte word. If the inscription covered an area of 0.5 square meters, what is the density of the information in bytes/meter<sup>2</sup>?

**Problem 2** – The Gutenberg Bible (middle) was printed in ca 1550 AD at about 2500 characters per page. If 1 byte codes one character, and each page measures about 300x450mm, what was the information density in bytes/meter<sup>2</sup>?



**Problem 3** – For each of the three examples of information, can you identify what properties and items go along with the five items above?

**Problem 1** – In the example of Egyptian hieroglyphics, assume the complete inscription is 500 characters long, and that each character can be stored in a 1-byte word. If the inscription covered an area of 0.5 square meters, what is the density of the information in bytes/meter<sup>2</sup>? Answer: 500 characters x 1 byte/character) = 500 bytes. Information density = 500 bytes/(0.5 meters<sup>2</sup>) = **1000 bytes/meter<sup>2</sup>**.

**Problem 2** – The Gutenberg Bible was printed at about 2500 characters per page. If 1 byte codes one character, and each page measures about 300x450 mm, what was the information density in bytes/meter<sup>2</sup>? Answer: The area of the page is 0.3 meters x 0.45 meters = 0.135 meters<sup>2</sup>, then the information density is 2500 bytes/0.135 meters<sup>2</sup> = **19,000 bytes/meter<sup>2</sup>**.

**Problem 3** – For each of the three examples of information, can you identify what properties and items go along with the five items above? Answer: Here is an example.

Hieroglyphics	Gutenberg Bible	DVD
Stone	Paper/Vellum	Plastic
1000	19,000	1 trillion
Chisel	Printing press	Laser DVD writer
Human eye	Human eye	Laser DVD reader
Brain	Brain	Computer software