

## ***Communicating with the Distant Future: Musings on an Epochal Code***

**by Benjamin B. Olshin, Ph.D.**  
**Director, S2R — Specialized Research + Reports**

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### **Transmission**

The voice of Marcus Aurelius speaks to me clearly as I leaf through the pages of a volume of his *Meditations* from my shelf. It is a small, compact book, with clear, crisp type. I can read at my leisure, and tuck it into my pocket to peruse during my daily commute. But this simple act of “information transmission” — my reading and understanding these words transmitted to me across the ages — relies on any number of textual, historical, and linguistic conditions. If any of these conditions had not been met, the information, the text with all its insight, philosophy, and wisdom would have been lost forever.

The words of Marcus Aurelius, the epigrams penned in Greek by an emperor now mere dust for centuries, reach me, the reader, centuries later, and thousands of miles away — no small feat. First, there is the critical issue of language: fortunately for us, Greek and Latin were preserved beyond the end of the Classical period, well into the Renaissance. Even as the languages’ places were taken by the other tongues or evolved into our present languages, the grammar and vocabulary were kept alive. Moreover, Greek and Latin texts came to be translated into Arabic, Spanish, English, and other languages. So now I can “access the information” of Aurelius’s text by way of one of these translations, or I can learn Greek, thanks to the grammars which also have been preserved, and read the original text. Still, we have the issue of *context*: other documents, also preserved as well as translated, that tell us who Marcus Aurelius was, the years he lived, his society and its achievements, and so on. In short, I have many tools at my disposal with which I can obtain an accurate and meaningful interpretation of the information in the text before me.

Finally, there is the question of presentation, in the literal, physical sense. The information, the text of Marcus Aurelius’ work, has to have been physically preserved from the time it was composed until now. Of course, the original material on which he (or his scribe) wrote has not survived — but copies (reasonably accurate ones, we will assume for now) were made on a consistent basis. After the development of printing, a

much greater number of copies were made of this text, thus increasing the information's chance of survival, and decreasing the chance of any corruption of the text. Through a combination of diligence by a whole series of anonymous scribes and printing technology, the *Meditations* have survived the ages.

### **Preservation**

Despite wars, social upheaval, natural calamities, and other disruptions in the history of human civilization, a surprising amount of information has been preserved and remains “readable” to this day. However, two critical issues still stand. The first concerns how can we preserve information from the present day so that it is both available and intelligible to our descendants after many epochs. Jeff Rothenberg has examined this problem in some depth in a discussion of digital documents. He notes that to preserve information for the distant future, not only would we have to develop media storage systems which would be both durable and free from obsolescence, we would also have to preserve the “interpretive” systems (e.g., system software as well as hardware) that could decode the information in the documents. As Rothenberg points out, there are organizations today which maintain just such older and obsolete software and hardware so that firms which have information stored in earlier computer formats can retrieve and convert important data. Despite the convenience that these services provide, there is the considerable cost of maintaining the antiquated software and hardware. The context required to preserve even simple information becomes too cumbersome.

Our problem, however, has more philosophical roots. First, how can information be encoded in a way that requires the minimal possible contextual support? That is, we can assume some cataclysm might well do away with all the “context” — hardware, system software, dictionaries, etc. Next, how can we preserve and transmit the information to future generations? The problem with all storage systems is that the storage parameters and paradigms change. New standards, as Rothenberg points out, are constantly emerging. Technology in the area of hardware and software-based informational retrieval systems will develop in directions still unknown to us. He notes that, “it is naive to think that the encoding of any document — however natural it seems to us — will remain readable by future software for very long” (Rothenberg, 44).

One anachronistic solution has been to go back to engraving, micro-etching information at an atomic scale on disks made of nickel. All that is needed to read the etched information is a powerful microscope — no proprietary software is required. A company in Los Alamos, New Mexico has designed this system, knowing that to preserve information, one needs “a medium that is compact, durable and immune to the fashions of information technology” (“Come Up and See”, 77). As the author of a review of this “retro” technology has pointed out, “digital media, regardless of their physical durability,

rely on the correct hardware and software being available to transcribe and decode them — a problem that is already making some early archives inaccessible”. But will a future reader, even armed with a powerful magnifying device, be able to understand the carefully engraved words and images?

### **Context**

All words and images can be reduced to a simple code. Our modern approach to the problem of information preservation has been to develop the simplest possible encoding system — simply utilizing zero and one — but this is a system which requires one of the most complex possible retrieval systems, namely, computers. The binary code, simple yet powerful, can retain a remarkable array of information, but still relies on context — is the encryption five-bit? Seven-bit? Is it text that is encrypted, or an image? We will always need the “context”, the “program”, to retrieve the information.

Ancient societies developed extensive systems for the preservation of information: complex epics, huge monuments, and elaborate rituals and traditions, laden with meaning. These systems required largely non-technological retrieval methods. Most societies had a person such as a wise man or shaman, or a group of persons, perhaps forming a brotherhood, priesthood, or secret society within the society as a whole. They had the passed-on knowledge of the epics, or an understanding of how to “read” the monuments, or carry on the society’s traditions. They preserved both the information and its context. These societies attempted to make their systems of information preservation ever more simple — epics were composed in patterns that were easy to remember, monuments were engraved with information to avoid the need for further memorization, and traditions were connected with certain songs, foods, and festival days to fix the information in the societal memory.

But monuments and memories, like magnetic tapes and diskettes, fade with time. The contextual world of shamans, high priests, and teachers, too, changes and sometimes disappears entirely. In the science fiction novel *A Canticle for Leibowitz*, a discarded shopping list becomes a sacred document after a nuclear holocaust, since all the context for the list has been lost. The future monks who find the list do not know how to “read” the text, since they have no knowledge of the society that created it.

Even systems based on apparently “eternal” entities are fallible. The mythic figures that the ancients encoded in the constellations still rely on the astrological context for their meaning to be preserved. Moreover, even the stars themselves have and will continue their gradual meandering across the heavens, causing the constellations to lose their shapes. Even if the appellation, “Orion the Hunter” is remembered by humanity in some distant future age, these descendants will not find him in their changed night sky.

**Encoding**

Before we can seek to build an information storage and retrieval system that will survive the ages, then, we must look for a simple encoding scheme (like the binary code), but with a decoding key that is both simple and easy to preserve intact. This key should be fixed to some aspect of existence that is apparently indestructible and immutable (Benjamin Franklin might say that it would be “death and taxes”). We must create an “epochal code” — one that can survive for many millennia. Let us say we choose the atomic weight of the hydrogen atom, or even the speed of light,  $c$ , as our decoding key, since both are universal constants. Fine, except for the fact that future societies may use different units for these measures, thus yielding different numerical values, and destroying the key.

One possible long-term key could be the human body; of course, it too has changed and evolved, and will continue to do so, but its form has remained relatively stable for millennia. Languages, systems of measurement, monuments — all have come and gone, while the basic configuration of the body has been stable: two arms, two legs, five digits each on the hands and feet; two eyes, two ears, one nose, one mouth. Barring any radical natural mutation or genetic engineering, the “human measure”, or “man as measure of all things” might be a good standard on which to base a decoding scheme. Paul Connerton, in his work on societal memory, speaks of memory literally *incorporated* in the body, through posture, gesture, and other configurations of the human form (Connerton, 72).

In fact, a system of encoding information in the body may have been used in the past. In religious writings, we often find the idea of the “macrocosm in the microcosm”, and especially the concept that man, as product of a divine creator, must himself contain the pattern of all creation. The human body is seen as encoding all of heavenly creation. The Jewish mystical work, the Kabbalah, for example, looks at the human body as being made in the image of God. Therefore, it is reasoned, the body also contains, or rather “embodies”, the information and meaning of the universe. We read in the Kabbalah (Franck, 123):

[T]he different parts of the body conform to the secrets of the supreme wisdom. The skin represents the firmament, which extends everywhere and covers everything, like a cloak... The bones and veins represent the celestial chariot, the forces that exist within, the servants of God... [A]s different figures formed by the stars and planets in the firmament that envelops us betoken hidden matters and profound mysteries — so do the figures and lines on the skin which encompasses the human body and are the body’s stars and planets. All these signs have a

hidden meaning and are the objects of attention of wise men who know how to read the face of man.

This passage clearly reflects the Kabbalah's concept of "as above, so below". But what is most interesting here is the last line, explicitly stating that the body itself can contain information.

The Chinese, too, consider the human body to be a microcosm of the universal creation. This is reflected in their concern with physiognomy and the belief in the existence of meridians in both the earth and the body. In the Chinese practice of face-reading or physiognomy, it is said that one can determine a person's personality, health, longevity, and even fate by a careful study of the facial features (Smith 187-195). Again, information, be it mystical or practical, is seen as "encoded" in the body.

The problem of encoding, however, transcends philosophical speculation. At Yucca Mountain in Nevada, spent nuclear fuel is to be stored in vast underground chambers carved into a ridge of volcanic rock. This radioactive waste must be kept protected and isolated in the site for *thousands* of years. Geologists and other scientists have studied the Yucca Mountain site to try to foresee the possibility of earthquakes, seepage, the rise of the water table, and other natural activity. But as Chris G. Whipple points out, human activity in the distant future around the site is much less predictable: "The speculation about whether and how inadvertent human intrusion might occur is much like the attempts to determine the type of society that might occupy Yucca Mountain: interesting to think about but unknowable." (Whipple, 77)

The site's radioactive wastes will remain dangerous for millennia, so somehow future generations must be warned not to dig in the area or intrude into the site in any way. A few years ago, Sandia National Laboratories put together a team comprising an anthropologist, an astronomer, an archaeologist, an environmental designer, a linguist, and a materials scientist to design a 10,000-year marking system for the Yucca Mountain site (officially called the WIPP or "Waste Isolation Pilot Plant" site). The criteria for the design were several, but the primary purpose of the marking system was to inform any future intruders onto the site that the area is highly dangerous.

The sheer scope of the project is mind-numbing. To think of our descendants — if there are any — some 10,000 years or more into the future is to reach into the realm of pure speculation. What will be their technology? Fantastically advanced? Or perhaps they will have returned to the ways of our hunter-gatherer ancestors. Will they have any record or understanding of any of our current languages and symbols?

Kai Erikson has commented on the profound problem of communicating about the dangerous site to distant future generations. He asks: “But what monuments can be counted on to last? What warnings can be counted on to be both decipherable and impressive several thousand years from now?” Aside from the problem of the erosion of monument of stone, metal, or other materials, there is again the problem of what symbols or markings we would put on them anyway. Erikson says of the WIPP project marking plan (Erikson, 50):

And what symbols or words shall we call on to make our point? Languages have half-lives far shorter than nuclear wastes, or so our experience to date would suggest, and even if we suppose English survives, the 20th-century expressions we select to convey the awe in which we hold those wastes are almost sure to have a different meaning and a different emphasis in the distant future.

Any encoding scheme involving language suffers from the mutability of the written and spoken word. A system involving symbols and markings is flawed in that these may be misread or misinterpreted. At the most fundamental level, a system of markings intended as a warning instead may be read by members of a future society as an invitation.

### **Decoding**

So we return to the same quandary. After we have encoded our information even in such a relatively immutable form as the human body, or carved it into some material harder than stone, how will our distant descendants decode the text, or even realize that there is something encoded at all? We still require context. The Kabbalah writings themselves preserve the context for “reading” the information encoded in the human body. A modern Chinese mystic will interpret a certain face in the same way that his distant ancestor did, because they share the same contextual material, namely occult texts and teachings on face-reading.

The designers of the WIPP site markings would like those signs to be understood by future generations even without any context preserved. But it is unlikely that the markings’ meaning could be preserved for millennia without a contextual structure. A recent German work entitled *Warnungen an die ferne Zukunft: Atommüll als Kommunikationsproblem (Warnings to the Far Future: Nuclear Waste As Communication Problem)* has advocated the establishment of a system to preserve this context. The work promotes the idea that “long-term institutions must be established to take responsibility for maintaining information about nuclear waste over millennia”. It is interesting that this same book suggests that this plan “may require radical transformation of the procedures of communication” (“Sending Signals to the Far Future”, 1).

A conference entitled “Transmittal of Information Over Extremely Long Periods of Time”, held in Norway in 1991, put forward the idea of preserving the nuclear waste warning information through the medium of religion. One participant in the conference stated: “The danger symbols must be included in the set of holy symbols of each religion” (Garfield (a) 1). A consultant with Bechtel proposed an “atomic priesthood”, suggesting that “information be launched and artificially passed on into the short-term and long-term future with the supplementary aid of folkloristic devices, in particular a combination of an artificially created and nurtured ritual-and-legend...” (Garfield (b), 2). It seems we have returned to the peculiar world of *A Canticle for Leibowitz*.

### **Meaning**

When we look at ancient symbols we often know or can guess the meaning because enough context has been preserved. But sometimes we are faced with symbols where we can perceive no meaning, and cannot even tell whether or not there is encoded information at all. All the context has been lost, and the symbols, or text, do not themselves seem to embody any discernible decoding device or key. Bill Thompson, in his book *Imaginary Landscapes: Making Worlds of Myth and Science*, devotes a chapter to the Rapunzel fairy tale. There he muses whether this tale, through its series of scenes, images, characters, and plots, embodies encoded ancient knowledge concerning cosmology and botany.

Tales such as that of Rapunzel, Thompson argues, are structured with four levels of meaning: the narrative, allegorical, moral, and analogical (Thompson 10-11). For our purposes, it is the analogical level which is most important, for that is where the “encoded” information is contained. The narrative and allegorical levels help preserve the tale as a whole, as it is transmitted from generation to generation through the ages. “Stories...”, Thompson says, “are themselves a form of cultural storage, for knowledge will survive the transmission through images for many more generations than it ever could through mere conceptual duplication.” (Thompson 33) Are there other such tales, texts, or symbols, storehouses of ancient knowledge for which we have failed to apply the proper keys?

Furthermore, what key would the people from earlier times have used to encode this information? Indeed, was the information, if there is any, even encoded consciously, or was it simply incorporated gradually into myths and fairy tales with the passage of time? Thompson comments that one could interpret the presence of the complex cosmological information in the Rapunzel tale as meaning that “the story had to have an author or authoress who could compose the story to sneak lost knowledge into a society...”. He points out, however, that in modern cultural theory, “we do not need to be that simplistic to insist that an authorial person is required for the existence of such a cultural story”, and

argues that a form of “autopoiesis” took place (Thompson, 41-42). The story forms naturally around the knowledge, through time, preserving it, just as amber slowly surrounds a piece of life, congealing, and leaving a clear window back to a distant, ancient age.

How is information best preserved? How can we ensure that our descendants will find and understand the knowledge we have left for them? Should we even make a conscious effort to preserve information and knowledge, or will such a preservation take place naturally, as Thompson suggests? These questions still linger, as we seek encryption, storage, and retrieval schemes that will survive into the distant future, with all the vagaries of our mortal existence.

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