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The Catacombs of St. Callixtus:
Comparing The Design and Impact
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Fabio Pasqualetti

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THE CATACOMBS OF ST. CALLIXTUS: COMPARING THE DESIGN AND IMPACT OF DRAMATIC TEACHING CONTENT FOR RADIO AND HYPERMEDIA

By

Fabio Pasqualetti

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ABSTRACT

THE CATACOMBS OF ST. CALLIXTUS: COMPARING THE DESIGN AND IMPACT OF DRAMATIC TEACHING CONTENT FOR RADIO AND HYPERMEDIA

by

Fabio Pasqualetti

Hypermedia is a new emerging technology that combines different forms of art expression such as graphics, sound, image, animation, ant text re-creating a new experience that allows the user to interact with them. Knowing how to use properly the different forms of art expression becomes vital if we want to be able to reshape and tailor them for hypermedia activities.

This project, that involves the creation of a prototype of interactive hypermedia and a radio drama on the catacombs of St. Callixtus, wants, comparing the two media, to illustrate the efficacy of dramatic teaching content, to stress the importance of sound as powerful medium able to sculpture experience, and to point out how thinking and designing sound for radio drama is quite different that doing it for an interactive hypermedia.

ACKNOWLEDGMENTS

I would like to thank God for the gift of my parents mom Teresa and dad Vittorio to whom I dedicate this effort, because they have supported me with love, understanding, and patience all these years of my life. The Salesian order because it gave me the privilege of studying in the USA for four years. St. Thomas Aquinas Parish for welcoming and making me feel home.

A special thanks to the members of my thesis committee, Dr. Carrie Heeter: not only I have appreciated her expertise but also her supportive friendship and encouragement in many critical occasions. Dr. Thomas Muth: his friendship and his inspiring visions have been always a great stimulation and provocation for my studies. Dr. Robert Albers: his didactic and discipline has helped me to think and organize my production, his friendship has had great influence too.

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Dr. Jeremy Mattson for correcting my English writing.

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INTRODUCTION

Hypermedia artists and designers are creating a new art and communications medium that expresses the non-linear "field" nature of electronic technology.

What apparently seems a cocktail of art forms it is slowly defining itself and developing its own personality. Non-linear, interactive, complex, multi-layered, virtual, etc. are just few of the adjectives used to describe this new experience.

What is definitely sure is that it is developing quickly in all directions and fields, its becoming a transversal language and way in which communication is experienced and celebrated.

This production thesis consists of the creation of a radio drama and an interactive hypermedia on the catacombs of St. Callixtus in Rome. It explores and analyzes the two different media in their constitutive elements. It recognizes the intrinsic difference between the two media in exploring, structuring, and presenting the same subject. Even though they share an element such as sound, the radical difference in the two approaches brings us to redefine the way in which we need to think of sound when we model and structure interactive experiences.

This thesis points out the necessity of recognize the complementary function of different media. It does not define the best medium but it points out how choosing a medium means to choose a way of looking at the world and reality. To experience it we need to enter the liminal space offered by the symbolic system in which the medium is made of.

From this reason to know the constitutive elements of a medium can help hypermedia designers to consider how best to integrate different forms of art into a coherent, interactive experience.

CHAPTER I

IMMERSED IN SOUND

NATURE OF SOUND

Sound as experience

More than a scientific [1] approach to the nature of sound, this aims to be an existential look at sound in relation to our life. In a society highly visually oriented, our capacity of listening is fading out, and with it our spirit. To begin to comprehend the mystery of life, it is not sufficient to touch and to see - we need to hear, to listen. Lorenz Oken, the nineteenth-century scientist and philosopher, once wrote: "The eye takes a person into the world. The ear brings the world into the human being." [2] Saying this does not mean to put eye and ear as alternatives. The objective to reach remains what Rajneesh so marvelously calls 'democracy of the senses'. [3]

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[1] For a scientific approach to the nature of sound I suggest: **Rossing, D. T.,** The Science of Sound, second edition, Addison-Wesley Publishing Company, USA, 1990. The book provides all the basic for the novice, yet also supplies the in-depth, detailed information professionals need.

[2] **Berendt, J. E.,** The Third Ear. On Listening to the World, Owl Book Henry Holt and Company, New York, first American translation 1992, p. 11-12.

[3] **Rajneesh, B. S.,** The Hidden Harmony, - Heraclitus, Rajneesh Foundation, Poona, 1976.

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The dominance of the eye

In 1609 Galileo Galilei looked through a telescope at the moon. "The spectacle of a man in early-seventeenth-century clothes peering through a primitive telescope is an icon of our understanding of the modern world. Yet all Galileo did was to believe the evidence of his own eyes, aided as they were by the crude optics of his telescope." [4] With the advent of the scientific revolution, listening, already a second-class experience, became irreversibly ignored and almost abandoned.

Interestingly "the word *mystic* comes from the Greek *myein* = close the eyes. Ever since ancient times mystics have, however, been viewed as human beings who see more." [5] Humanity's great spiritual books -- the Bible, the Koran, the Upanishads -- are full of exhortations and instructions about listening. Jesus in more than one occasion said: "Whoever has ear to hear ought to hear." [6] It is obvious that he referred not to the simply physical action of the ear

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[4] **Appleyard, B.,** 'Understanding the Present, Science And the Soul of Modern Man, Doubleday, New York, US first edition 1993, p. 17.

[5] **Berendt, J. E.,** The Third Ear. On Listening to the World, Owl Book Henry Holt and Company, New York, first American translation 1992, p. 33.

[6] **Luke, 8:8,** The Catholic Study Bible, NAB,Oxford University Press, NY, 1990.

but to the connection between hearing and being. For Isaiah when God speaks all are called to listen: "Hear, O heavens, and listen, O earth, for the Lord speaks." [7] In St. John's prologue it is stated: "In the beginning was the Word, and the word was with God and the word was God." [8] That voice was there from the very beginning: the primal voice. It was that divine, creative voice which moved upon the face of the waters when God created the world. Many spiritual traditions - Judaism, Islam, Zen, and many shamans - expressly forbid the making of an image of God and the divine since images and the eye excessively direct the attention outward. Instead they say: Listen to the divine voice. You can hear what is within. Listen to the inner voice.

The loss of listening

Listening became less frequent as the West increasingly pursued rationalism. Seeing became the predominant model of knowing and experiencing reality. This line of thought has also affected our idea of communication. We can find confirmation of this

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[7] **Isaiah**, 1:2, The Catholic Study Bible, NAB,Oxford University Press, NY, 1990.

[8] **John**, 1:1, The Catholic Study Bible, NAB, Oxford University Press, NY, 1990.

in works like Lippmann' s introductory chapter of "The World Outside and the Picture in Our Heads". "Lippmann is arguing for a general theory of representation that divides culture into the areas that represent reality well (such as science), those that represent it less well (such as art), and those that do not represent it at all (such as journalism), despite their pretense of doing so." [9] In answer to this point of view James W. Carey, in his book *Communication as a Culture, Essay on Media and Society* , points out how for Lippmann's view, reality is picturable, and truth can be achieved by matching an independent, objective, picturable reality against a language that corresponds to it. The basic metaphor of communication is vision. Carey also compare the answer of Dewey to Lippmann and in one of Dewey's quotation we can read: "expansion of personal understanding and judgment can be fulfilled only in the relation of personal intercourse in the local community. The connection of the ear with vital and out-going thought and emotions are immensely closer and more varied than those of the eye. Vision is a spectator: hearing is a

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[9] Rorty, R. Philosophy and the Mirror of Nature, Princeton, NJ, Princeton University Press, 1979.

participator." [10]

Even though the largest contest of this comparison is part of Carey's speculation about the distinction of ritual view of communication versus a view of communication as transportation, it is interesting to notice that in stressing seeing or hearing we construct our world, experience and communication in a total different way.

A different perspective

"For the Chinese the eye is a *yang* sense expressing the sun and masculinity whilst the ear is a *yin* sense embodying the moon and femininity. That is also apparent in the Western world. The eye thrusts out into the world, and in many cultures is symbolized by an arrow which has long been a phallic symbol. The ear is receptive, often compared with a shell, which in turn evokes the female sexual organ. It is not just chance that the eagle is so often to be found in the coats of arms and emblems of power-conscious states and cities. The eye says I. We sense when someone is looking at us. their gaze insists: Pay attention to me! The listener does not put the

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[10] Carey, J. W., Communication as Culture, Essay on Media and Society, UNWIN HYMAN, Boston, second edition 1990, p. 90.

emphasis on himself or even the other person. he does not insist on the separation between subject and object. The ear establishes a 'more correct' relationship between ourselves and others. It implies unity rather than division." [11] As beautifully Mathieu says it: "The sound of the world begins with your own two ears centered in your personal space; but if you listen attentively enough, and live long enough, you can hear the whole globe. You listen locally and hear globally. You take it all on." [12] And again to reinforce the forgoing: "To know the sound you have to notice it first. Too bad that civilization requires the knack of folding the senses under, of choosing not to hear. I need ways to remind myself that I'm the central fish in this sea of sound." [13]

Toward an integral approach to life

With this long introduction I tried to stress the importance in our society to recover the dimension of listening, and I see in the advent of interactive hypermedia an opportunity to re-discover not

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[11] **Berendt, J. E.,** The Third Ear. On Listening to the World, Owl Book Henry Holt and Company, New York, first American translation 1992, p. 27-28.

[12] **Mathieu, W.A.,** The Musical Life. Reflection on what it is and how to live it, Shambhala, Boston, 1994, p. 22.

[13] **Ibid.** p. 41.

only listening but eventually touching and smelling in order to accomplish what we called at the beginning the 'democracy of the senses.' However I think is extremely important to start with listening because is the key of opening ourselves to the 'other' whoever or whatever may s/he,it be.

The choice of producing a radio drama and an interactive hypermedia project is to explore how sound can be used in both media in order to recreate an experience and how using these two media we may try to re-educate ourselves to a more integral use of our senses.

The first step to become a listener is to start to become aware we are immersed in sounds and they are there to be discovered. It is the experience of abandoning ourselves and searching for the 'other'. This process, however, does not consist of going out or reaching out, but rather letting the 'other' to come into ourselves.

Interacting with sound is a natural condition that takes place at the beginning of our life. Recovering the musical dimension of our life is not only a therapeutic experience but also a possibility to look at the world in a completely new way. The looking of the blind

ear.

INTERACTING WITH SOUND

Made of music

We cannot not interact with sounds. Everything in us and around us sounds. "You are made of music. The whole stream of your life, already musical, is simply waiting for you to hear it." [14]

To a rational mind this can sound like simply poetry, but more and more some people have come to realize how much influence sound has on our body. Larry Dossey, for example, says: "In humans, the physical body reflects the sound we perceive, down to the biochemical level. So sensitive are we to sound that noise pollution has been called the most common modern health hazard. High levels of unpleasant sounds cause blood vessels to constrict; increase the blood pressure, pulse, and respiratory rates; release extra fats into bloodstream; and cause the blood's magnesium level to fall." [15]

After all, this should not surprise us if we think that our first

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[14] Mathieu, W.A., The Musical Life. Reflection on what it is and how to live it, Shambhala, Boston, 1994, p. 25.

[15] Dossey, L., *The Body as Music*, in Music and Miracles, A Companion to Music: Physician for Times to Come, compiled by Don Campbell, Quest Book, Wheaton, Ill. U.S.A., 1992, p. 53.

experience of hearing takes place in our mother's womb. In that dark place where we do not even see we interact with the world with our senses of hearing and touching.

Music from DNA

There are studies today that go further in trying to understand the relation between sound and our body. Dr. Susumu Ohno, a geneticist at Beckman research Institute of the City of Hope in Duarte, California, did an experiment that might explain why our body is intrinsically musical. Working with the DNA, Dr. Ohno assigned musical notes to the different substances that constitute the DNA. He chose also a particular key and timing, as well as the duration of each note. The result was a melodic composition that was harmonized by Dr. Ohno's wife, a musician, and performed by professional musicians. [16] He also showed that it is possible not onlyto make music starting with DNA, but also to do the reverse, starting with a great piece of music, assigning nucleotides to the notes, and ending up with a particular type of DNA.

Looking for harmony

There was a time in which human kind believed that everything

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[16] Ibid. p. 55.

in the universe was in harmony and life made sense. That was the time in which everything was viewed and experienced in harmony. With the advent of the scientific revolution that vision disappeared and the universe crashed heavily on the human's shoulder. Having lost the dialogue with the world, man became a monologue. Now science is trying again to recover the sense of belonging. Theories of chaos and complexity are trying to make sense of this world that left us without sense. Perhaps one way to regain our dimension is to give to art and religion the dignity that now belong only to science. Art and religion are like science, ways of enquiring into life and reality and in many respects have the advantage of expressing them in a language that is more familiar to the people.

If we look at our body and the world in which we live as complex but organic musical composition, instead as a mere mass of atoms, it might help us to understand the necessity of creating social, political and structural environments that will allow to people to harmonize among themselves and with the world. if we consider life as a musical composition, we probably will recover the fundamental element that is needed to appreciate music--silence. Silence is the condition *sine qua non* for listening. It is also the

beginning of any performance of any act of creation and respect.

One might ask why I am indulging in these concerns and personal reflections when this thesis is about producing a radio drama and interactive hypermedia on the Catacombs of St. Callixtus. My answer is that whatever we do is a reflection of what we are, and it is to important for me to understand who we are if we want to offer an experience to others that is part of us. My concerns are after all my hopes that our life can be better if we learn to listen to each other, and if working with sounds and interactive experience can help to educate people to appreciate each other, then I am going in the right direction.

RADIO DRAMA THE ARCHITECTURE OF SOUNDS

At the heart of radio drama

My focus in this section will be neither the history of radio nor the history of radio drama but rather an attempt to describe the essence of radio drama and its possible educational use in a society that is dominated by visual activity.

A simple exercise that can give us the idea how radio drama works, consist of sitting in a circle with some friends in a dark room and start a conversation. Suddenly we will realize that the

words, that normally are function of exchanging information, have a complete different texture almost a new architecture. They are not only meaningful but they acquire a personality, they have a body and dynamics. We can "see" the words, and our mind, surprisingly, has become the stage of an animated action. Supposedly at a certain point the conversation stops and everybody is just there listening. Slowly we will start to listen first to our breath, then our heart beat. Moreover after a while we will be able to detect different sounds that we probably had not even noticed at all.

Radio drama uses our capability of recreating "visual" experiences in our mind as a way to offer a constructed and articulated soundscape where we can journey inside and interact with sounds. Radio drama is about the architecture of sounds. It consists of sculpturing, shaping, painting, modeling, tailoring, visualizing, and assembling sounds in a well designed sound construction. It is multi-experience of words, music, and sound effects. These can overlay, overlap, cross fade, fade in, fade out, be consonant, dissonant, juxtaposed, parallel, synchronous, a-synchronous, in linear sequence, specially processed, etc...

The process of creation of in any of the modern forms of art

expression that include technology requires not only the knowledge of what the creator wants to share but also the specific language of the medium, in the case of radio drama, the language of sound.

A close-up of a mosaic gives us the impression of a simple almost banal technique of aligning small pieces of squared material, but as soon as we zoom out we can contemplate the beauty of the composition and the geniality of the design. Nevertheless it is important to know the fundamental things that can give us the freedom to express ourselves.

We will briefly explore the properties of sound in order to have a better grasp of how sound works and what to do with it.

PROPERTIES OF SOUND

General definition

The general definition of sound waves is that they are "vibrational disturbances that involve the motion of molecules transmitting energy from one place to another." [17] Even though it would be interesting to analyze the components that make up a sound wave (frequency, amplitude, velocity, wavelength, and phase) and

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[17] Alten, R. S., Audio in Media, (third edition) Wadsworth Publishing Company, California, 1990, p. 11. " What make this reaction possible is air or, more precisely, a molecular medium with a property of elasticity."

seeing how by manipulating these components it is possible to shape and sculpture different sounds that can create different soundscapes, [18] in this section I am more interested to analyze those properties of sound that are derived from its communication purpose. [19]

The Communication purpose of sound

We call sound any audible vibration that has a purpose inside a context and noise that audible vibration without purpose and context. It is clear that the same audible vibration can be sound at one time and noise at another.

It is common, in structuring any mediated experience using sound, to distinguish *literal sounds* and *non-literal sounds* . The first include forms of speech and the environmental sounds, according to Zettl, these sounds are *referential* which means they convey a specific literal meaning and also that they refer to the sound producing source (source-connected). The seconds are

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[18] This word is taken from the title of the a book of Murray Shaffer, The Soundscape. He refers to this term "soundscape" as our sonic environment, the ever-present array of noises with which we all live. I use it here as creation of any sound environment such as the soundscape of a radio drama, television show, record, ambient and so on.

[19] Zettl, H., Sight Sound Motion, Applied Media Aesthetics, (second edition) Wadsworth Publishing Company, Belmont, California, 1990, p. 333.

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deliberately source disconnected and do not evoke a visual image of the sound-producing source. [20] These two basic distinctions can facilitate the understanding what Zettl call the major functions of sound: information, outer orientation, inner orientation, energy and structure. [21]

Major functions of sound in an interactive context

The major functions of sound easily apply to traditional media such as radio and television, but they do not easily apply to interactive hypermedia. Let's start to analyze in a interactive context the first function: 'information'. The information function in radio or television generally indicates the communication of specific verbal information, and this includes dialogue, direct address, and narration. But when we apply this to interactive hypermedia the definition in my opinion has to be broadened. The sound of a clicking button becomes specific information of an operation that is taking place. The sound of a transition from one

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[20] *Literal* sounds ares sometimes called "diegetic" sounds because they occupy "story space" while *non-literal* sounds are called "nondiegetic", occupying non story space. In Zettl, H., Sight Sound Motion, Applied Media Aesthetics, (second edition) Wadsworth Publishing Company, Belmont, California, 1990, p. 338.

[21] Ibid. p. 341

screen to another not only can set the mood but does give specific information of movement. The sound that some computers make when the user is attempting something that cannot be done is a specific information. Again we can see how much important it is to understand the context in which we want to recreate a specific experience with sound to determine its function.

The outer orientation function of sound presents the property of sound in defining space, time, and situations. The most difficult thing to deal with in interactive hypermedia design is 'time'. Sound is an experience that moves and develops over time. Giving to the user the possibility to control the action also means giving the possibility to interrupt the development of a sound and therefore its specific communication. This is a problem that points out the necessity to think of sounds for hypermedia that can have powerful meanings in a concise time. Most of the time it is a question of one or two seconds or even less. Not only, there are cases in which longer sounds are needed to describe a transition from and screen to another. Given to the user the possibility to interrupt the action, it would be very nice to have a smooth fade out of the sound instead of an abrupt cut of it. Echoes of this problem come also from the

multimedia musicians' world: "Interactive music poses more logistic problems than interactive graphics or text. It's easy to pause the production to wait for a menu selection that directs the flow of text and graphics in one direction or another. But what do you do with the music during this pause? Working with conventional multimedia software and standard MIDI (Musical Instrument Digital Interface) Files provides only two options: The music also pauses, or it loops until a menu choice abruptly poses the danger of breaking up the flow of the music unless it's carefully handled." [22]

The inner orientation functions of sounds include; mood, internal condition, energy, and structure. If the first three are easily applicable to hypermedia what really creates problems is the structure. This function indicates the capability of sounds to establish or supplement a rhythmic structure of the screen event. [23] MTV is definitely a place where to see this function applied in its orthodox and unorthodox way. The rhythmical composition of the images and sounds can create a sophisticated experiential texture

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[22] Kendall, R., *Interactive Installation* in Electronic Musician, March 1994, p. 86.

[23] Zettl, H., Sight Sound Motion, Applied Media Aesthetics, (second edition) Wadsworth Publishing Company, Belmont, California, 1990, p. 349.

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where for example the juxtaposition between images and audio rhythm can create dynamism, dissonance, excitement, displacement or other feelings. This is hard to create in interactive hypermedia because the rhythm of the event is established by the user's activity and pace. This is why I am trying to compare the two media art expression radio drama and interactive hypermedia, hoping that making a close comparison of the two, I might find indications of a future approach to the use of sound in interactive hypermedia that could maintain the properties of a sound experience but that at the same time could correspond properly to the nature of an interactive experience.

Shift of paradigm

It is typical of any new technology to have a transitional period in which it is looking for its own identity. When photography was invented in the nineteenth century it was used to emulate painting styles with the camera. It took a while to understand the true nature of the new language. Using Steven Holtzman's words we can say that "Digital expression represents a radical new paradigm. It is a break with established tradition. just as new computer tools in the creative process require a different way of thinking about

expression--that is, in terms of explicit rules and abstract structures--the use of computers themselves will stimulate a shift in the very nature of expressive languages." [24]

Till now in many interactive productions, including my small production, sound as been produced by analog or digital instruments and transferred into the computer; still the sound was thought in terms of classical composition, but would be interesting to ask how a computer sounds when it sounds 'like a computer'? With this question Holtzman indicates that perhaps the "idiomatic sounds of a computer can be found in representing sound *the way a computer creates sounds* : in terms of machine instructions. Not Fourier synthesis, not frequency modulation synthesis, but *store, retrieve, add, subtract, multiply, divide,* and *logical shift* ." [25]

It is very hard to jump to conclusions at a time when the computer, in spite of the incredible acceleration in its innovation, still is in its infancy, a new almost unexplored frontier that is hiding incredible possibilities. The computer will open new

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[24] Holtzman, S.R., Digital Mantras,The Languages of Abstract and Virtual Worlds, The MIT Press, Cambridge, Massachusetts, 1994, p. 241.

[25] Ibid. p. 243.

languages, new means of expression not before possible or even conceivable.

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CHAPTER II

THE ART OF BRICOLAGE

NATURE OF THE BEAST

Interactive Hypermedia

What is now interactive hypermedia grew out of a very wide range of parallel developments in fields as diverse as art, film, television, telecommunications, digital optical storage, psychology and computer science. Over the period 1945-1985 a number of visionary thinkers, artists and writers (a list headed by Vannevar Bush, Ted Nelson, Alan Kay and Duglas Engelbart) had mapped out the possibilities of a singular medium that combined all the other media in such a way that people could control it using natural gesture and language. [26]

Definition

The word Hypermedia is a fusion of Hypertext and Multimedia [27]

HYPERtext + MultiMEDIA

HYPERMEDIA

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[26] Cotton, B., & Oliver, R., Understanding Hypermedia: from Multimedia to Virtual reality, Phaidon, London, 1993, p. 10.

[27] Howell, G.T., Building Hypermedia Applications: A software Development Guide , McGraw-Hill, Inc. New York, 1992, p. 3.

The term hypermedia was first coined by Theodor H. Nelson [28] in the 70s in order to describe a new media form that utilized the power of the computer to store, retrieve and display information in the form of pictures, text, animations and sound. He had already used the prefix "hyper" to describe a system of non-sequential writing: "text that branches and allows choices to the reader". In "hypertext" textual material could be interlinked, providing a system which would break down traditional subject classifications and allow non-computer-literate users to follow their own lines of enquiry across the whole field of knowledge.

Art, the catalyzer of changes

At any time of rapid technological and social change, the nature of the Zeitgeist is apprehended most readily by artists, who often succeed in inventing a new form, or combination of forms, with which to express their insight.

Cubism, for example, cam be considered as a parallel to the shift of thinking in science: from the single, universal Newtonian point of reference to a new concept of space and time relative to the

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[28] Cotton, B., & Oliver, R., Understanding Hypermedia: from Multimedia to Virtual reality, Phaidon, London, 1993.

observer.

Hypermedia artist and designers are creating a new art and communications medium that expresses the non-linear "field" nature of electronic technology. As Marshall McLuhan pointed out in 1963 in *Understanding Media*, the instant communication offered by electronic media leads to fragmentation. Sequence is replaced by montage. As it emerged from the convergence of the two dominant electronic technologies, television and computing, hypermedia is indeed designed to be fragmented.

What makes Hypermedia new?

An analogy is often drawn between film and hypermedia. Those involved in hypermedia face problems similar to those confronting the early pioneers of cinema. People actually had to invent the close-up, the fade, the dissolve. And when sound came along they had to reinvent the medium to incorporate that. The same is true for hypermedia. There are, however, two differences: hypermedia is likely to be more widespread in its application than film has ever been; and as a medium it may represent a more radical break with the past than all the other new media of the twentieth century, apart from computing. It is probable that hypermedia will become

the "front-end" (the part the user deals with) for IT (information technology) systems of all kinds, whether they be design systems, cash machines at the bank, control systems in a factory or databases in an office. [29] The philosophy behind hypermedia is to make the users creators and not simply consumers.

Hypermedia's ability to integrate material of many different forms and to allow reorganization of the relationships within that material in a multitude of different patterns offers new ways of communicating and new tools to operate with.

The Goal of Hypermedia

The long-term goal of hypermedia, as a communications medium, is to enable the user to experience complex situations with elegance and simplicity using most if not all our senses, and as a tool for managing complexity by allowing the user to assemble and manipulate a mass of disparate multi-sensory information elements until they fall into patterns that make sense.

A crucial aspect of the work that needs to be done is what Nicolas Negroponte calls "semantic compression". Semantic

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[29] In regard to the problem of interface design, abundant material can be found in: The Art of Human-Computer Interface Design, edited by Laurel, B., Adison-Wesley Publishing Company, Inc., New York, 1990.

compression is necessary because it is only by using simple, elegant means of expressing complexity without violating variety and diversity that workable solutions will be found to the problems that confront society. [30]

Goals can be achieved knowing direction, and what to do along the way. Knowing the basic ingredients that constitute an interactive hypermedia experience becomes vital not only for those who want to design one, but also for those who what to use it as educational tool.

BASIC INGREDIENTS

Any analysis tends to fragment the whole picture, and the risk is that at the end we miss the big picture. Analyzing the ingredients that constitute an interactive hypermedia is a way to remain aware of the complexity of this medium and therefore the necessity of exploring them more and more while we are getting use to this new art of communication.

Image

Images are used in a multiplicity of ways: to entice, inform,

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[30] Cotton, B., & Oliver, R., Understanding Hypermedia: from Multimedia to Virtual reality, Phaidon, London, 1993, p. 38.

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appeal, communicate, and enrich, they can excite passions, express feelings, communicate ideas, explaining complex relationships, become objects of aesthetic pleasure, mediation and contemplation, and even tell stories.

In hypermedia, images can be used in all these ways, and they can also be linked together with text and other images to create new kinds of relationships that can be explored interactively by the user.

It was Sergei Eisenstein who identified "montage" as basic principle used by all artist in the exposition of a theme, pointing out that when two images (or sequences of images) are placed together they inevitably combine "to create a new concept, a new quality, arising out of that juxtaposition". In other words the act of perceiving two or more images (or sounds, or words) in juxtaposition is in itself "interactive": it is the observer who is creating the "new concept" in the space "between" the different stimuli. In hypermedia artists and designers have a communication tool that offers a multiplicity of means by which this principle may be applied so that physical interaction can supplement the "perceptual" interaction of montage.

Text and typography

We have developed the arts of calligraphy and typography to allow us to modify the visible word, to clothe it with additional qualities that are expressive (brand names), personal (the signature), authoritative (legal documents), informative (road signs), funny (comic books mastheads), ephemeral (dot matrix alphanumeric on tickets and receipts), and so forth. Over the last five hundred years several thousand typefaces have been designed that offer designers a broad spectrum of these modes. Typefaces are a typographer's "palette", and can be selected and combined to compress additional meaning into the words they are representing.

We are all familiar with "text" as printed or typed words, and even words displayed on television screen and computer monitor, but "hypertext" is a more sophisticated concept. It is not just an extension of the idea of the cross-reference. It wants to be the creation of meaningful links between information that are stored in text form. The central idea is to provide the reader with a variety of different perspectives on a body of information that can be explored interactively.

Graphics

Graphic designers working in advertising have extended the language of print to produce hybrid image-text juxtapositions that are powerful communication tools.

Hypermedia accommodates most of these conventions from the printed page, and adds other graphics features such as animation (of both words and pictures) and context-sensitive fonts that change size and style in response to the user's action.

The "hypergraphic" designer faces some very interesting problems. for example, "invisible" images, graphics and text fields: items that become visible as a result of the user's interaction. How these elements fit into or overlay the current display, and how efficiently the designer can employ programming techniques to display text in real time, as the user is watching, make hypermedia graphics an art quite different from designing in print.

Audio

"Sound is a familiar and natural medium for conveying information that we use in our everyday lives. The following examples help illustrate the important kinds of information that sounds can communicate:

- Information about **physical** events:

  We can hear whether a dropped glass has bounced or shattered.

- Information about **invisible** structures:

  Tapping on the wall is useful in finding where to hang a heavy picture.

- Information about **dynamic** change:

  As we fill a glass we can hear when the liquid has reached the top.

- Information about **abnormal** structures:

  A malfunctioning engine sounds different from a healthy one.

- Information about event in **space**:

  Footsteps warn us of the approach of another person." [31]

From these examples we can easily picture different applications of sound as a mode of information. The invisible nature of sound allows the computer designer to assign sounds to information when using visual inputs would only disturb the creative process. It can also establish the mood of a specific application. A CD-ROM about breast cancer will not use sound in the same way a

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[31] Mountford, S.J., Gaver, W.W., *Talking and Listening to Computers*, in The Art of Human-Computer Interface Design, edited by Brenda Laurel, Addison-Wesley Publishing Company, California, 1992, pp. 321-322.

CD-ROM about cooking will use it.

Sound as an ingredient of hypermedia design has to be thought of and structured harmonically with all the other ingredients. I like to think of the process of design as similar to cooking. I wish I could soon smell the experience.

Video

Motion video, like sound, is a time-based medium. Designers are only just beginning to explore the potential of combining linear, time-based media into the random access (non-linear) structure of hypermedia programs.

Like all the other components of the media matrix, film and video become building blocks by means of which the information architect can construct a rich media landscape for the user. Film and video will be used to provide narrative and instructional guidance at various stages of the user's exploration of the time/space environment of the hypermedia program.

The nature of storytelling changed fundamentally with the invention of print technology in the fifteenth century. From being a group activity, storytelling became a solitary, one-way communication between the author and the reader. The tradition of

dramatized storytelling lived on in the theater, and later in film and television. Common to these "linear" media developments is the notion of the audience as passive consumers. Hypermedia, however, offers a return to the idea of an audience of active participators. Without diminishing the role of the author/director, it fundamentally changes it, establishing the new role of "information architect", whose task is the orchestration of the components of a story or a body of knowledge, so that an environment is created in which the user will take an active part. [32]

HYPERMEDIA DESIGN

Starting a new experience

When I started my masters program I took a course in hypermedia design. One of the first things we were asked to do was to design a computer interface that would respond to our ideal vision of interface. Something that would be useful, simple, practical, and at the same time elegant, easy to use, intelligible, friendly and so on. At that time I did not know too much about interface design and we had not already gone through literature on

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[32] Cotton, B., & Oliver, R., Understanding Hypermedia: from Multimedia to Virtual reality, Phaidon, London, 1993, pp. 44-67.

the topic. The result was that I designed a elegant robot that looked just like a person. Its face and its body were human except for its chest that could become a screen on which to view and manipulate data. The idea of having a 'powerful, obedient friend' synthesized most of the science fiction that I read, but at the same time was pointing out how the best interface for a person, has to be like a person. Inspiring or fretting, this will probably be the natural development of computer design and technology.

Looking for the possible

After this futuristic beginning where our imagination could express itself freely, we started to see concretely what can be done today, with the available technology to improve interface design. This step brought us to of the literature about interface design.

First Things First

Very simple but often forgotten was that "the first principle of human interface design, whether for a doorknob or a computer, is to keep in mind the human being who wants to use it." [33]

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[33] Rheingold, H., *An interview with Don Norman* in The Art of Human Computer Interface Design, edited by Brenda Laurel, Addison-Wesley Publishing Company, inc., fourth printing, March 1992, p. 8.

Dealing with metaphor

The further step was dealing with the concept of metaphor. Linguistically, a metaphor is described as a figure of speech containing an implied comparison, in which a word or phrase ordinarily and primarily used for one thing is applied to another. Extending this concept, we can say that metaphors function as natural models, allowing us to take our knowledge of familiar, concrete objects and experiences and use it to give structure to more abstract concepts. [34] Brenda Laurel offers the theater as overall metaphor for the computer, and she says that there are "two reasons to consider theater as a promising foundation for thinking about and designing human-computer experiences. First, there is significant overlap in the fundamental objective of the two domains--that is, representing action with multiple agents. Second, theater suggests the basis for a model of human-computer activity that is familiar, comprehensible, and evocative." [35] From her point of view at the heart of theater as metaphor for computer there is

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[34] Erickson, T.D.. *Working with interface Metaphors* in The Art of Human Computer Interface Design, edited by Brenda Laurel, Addison-Wesley Publishing Company, inc., fourth printing, March 1992, p. 66.

[35] Laurel, B., Computer as Theater, Addison-Wesley, Publishing Company, 1992, p. 21.

action and she underlines the importance for direct engagement emphasizing emotional as well as cognitive values. Direct engagement conceives of human-computer activity as *designed experience*, and it reconfigures the design of applications and interfaces as a single integrated process. [36]

The user is not an abstraction

Another step is to think of the user as real one with specific problems and living in a specific environment. Shneiderman would say that "successful designers go beyond the vague notion of "user friendliness" and probe deeper than simply making a checklist of subjective guidelines. They must have a thorough understanding of the diverse community of the users and the tasks that must be accomplished. Moreover, they must have a deep commitment to serving the user, which strengthens their resolve when they face the pressure of short deadlines, tight budgets, and weak-willed compromisers." [37] In other words "A good designer has to take the user's point of view, consider what information the typical user

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[36] Ibid. p. 8.

[37] Shneiderman, B., Designing the User Interface. Strategies for Effective Human-Computer Interaction, Addison-Wesley Publishing Company, 1992, p. 8.

must have to work properly, easily, efficiently. The best way to do this is to observe and interact with the typical people for whom the product is designed. This means testing out the design on them--and being willing to change them when the users find themselves confused." [38]

Jumping to an higher level

The difficulty with interface design consists of the fact that there are not recipes or standard solutions. "A design solution has to be consistent with the entire problem to be solved. What are the needs of the group, what are the standard working patterns? You can't just suppose a need or a solution out of context. You have to examine the entire situation." [39]

Probably what will characterize most the future of hypermedia production and its success is the fact that is a form of art that can be done with a small team of people but that requires a high level of synergy at all levels of cooperation.

Interface design calls for an interdisciplinary work, calls for

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[38] Donald, A. N., Turn Signals, Are the Facial Expressions of Automobiles, Addison Wesley, New York, 1992, p. 23.

[39] Ibid. pp. 50-51.

collaboration, things that require a shift of mentality inside the different disciplines. Probably we need what happened to the filmaking art form: "the fundamental change that Griffith brought to filmaking was a shift in emphasis from *what* was being presented to *how* it was being presented--from an engineer's craft to an artist's. Filmaking was never thought of in the same way again." [40]

Art or Craft

It might be that looking at all the variables that have to be taken in consideration in designing a interactive hypermedia, somebody would wonder where there is the space for creativity and expressivity--where does the artist comes in. In the experience that I will present in the next chapter I will illustrate that each part of the thinking and design of interactive hypermedia is a creative process and a challenge to creativity. Because the complexity of the medium the mono-dimensional ego has to learn to become the 'you'. In this process of caring for the real needs and situation of the user is hidden the artistic potential that hypermedia can offer to anybody who wants to take it seriously. Art in

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[40] Heckel, P., The Elements of Friendly Software Design, SYBEX, USA, second edition 1991, p. 8.

hypermedia is not melodic but harmonic. It is the result of a polyphonic effort in which no soloist decides everything, but rather a chorus of voices interacting along the process. Hypermedia is a pluralistic art form that takes its strength from the plurality of voices represented in the design. That does not mean that there is lack of order or organization; actually these are essential elements of the design, but they are at an invisible level. What is on the surface is an interesting texture that allows the user to enter the experience.

Unfortunately, for academic reason, my experience is an expression of the old school. Everything has been done by myself. I tried to be polyphonic as much as possible, but I felt the real limits of working by myself in such an experience.

CHAPTER III

THE CATACOMBS OF ST.CALLIXTUS

THINKING AND DESIGNING THE EXPERIENCE

THE CHOICE OF THE SUBJECT

A live experience

I have lived for two years in the area of the Catacombs of St. Callixtus and experienced the sense of mystery and sacredness that envelopes the underground cemetery. I have witnessed hundreds of thousands of people coming from all over the world to visit and re-experience those cultural elements that were part of the first Christian Church's life. I would say that the importance of the catacombs may be summed up in the words of Orazio Marucchi: "The catacombs can be regarded as the cradle of Christianity and the archive of the primitive church. Their paintings, sculptures and inscriptions provide the most valuable material for illustrating the usage and customs of the early Christians and the history of the persecutions they suffered. Moreover, they enable us to show the identity of the faith lived in the first centuries with the Act of faith, or Credo, the we profess today. This has great value for us because these monuments, the catacombs, belong to the first

centuries of Christianity." [41]

The purpose

With these visions in my mind I always wanted to create something that could give to someone, who could not visit the Catacombs of St. Callixtus, the possibility of having an experience that could stimulate not only the cognitive dimension but also the emotional sphere of the person.

The choice of the medium

Interactive hypermedia seemed to be the natural place where I could try to implement and construct my dream. Persons like Brenda Laurel, with her vision of computers as theater, triggered my attention in looking at this new technology from a different perspective. The use of *dramatic techniques for orchestrating human response*, [42] the concept of *direct engagement* as direct experience

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[41] Baruffa, A., The Catacombs of St. Callixtus, History, Archaeology, Faith, Translation By William Purdy, Published by L.E.V. Vatican City, 1993, p. 19.

[42] In the book Computers As Theater Brenda Laurel uses *drama* rather than *narrative* as global model for human-computer. The reason of this choice lies in what she considers to be the key differences between drama and narrative. First, for Laurel narrative is *description* while drama is *action* ; as a consequence drama is capable of *Enactment* involving direct sensing as well as cognition. Second, drama is able of *intensification*, meaning that incidents are selected, arranged, and represented so as to intensify emotion and condense time. Narrative for Laurel is the reverse process *extensification*. Third, using *unity of action versus episodic structure*, Laurel says that drama typically represents a strong central action (*unity of action*) with separate incidents that are causally linked to that action, while narrative tends to be more

of a mimetic world without mediation or distraction, the use of *multi-sensory representations* in order to encourage and integrate a *holistic response*, are just few of the many concepts that Laurel explores in her book and that shed light on the tendency to look at interface design only as expression of specific functionality provided by an application. On a larger perspective Carey's idea of communication as a "symbolic process whereby reality is produced, maintained, repaired and transformed" [43] situates interactive hypermedia among the ways to inquire into reality and reconstruct it, and the fact that it uses a non-linear approach does not diminish its capacity to re-create a valid experience; actually it is a way to express the complexity that we encounter in our daily life. Iser' s idea that the "text itself simply offers 'schematized aspects' through which the subject matter of the work can be produced, while

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episodic and the incidents are quasi-independent and connected thematically rather than causally to the whole.

While I may accept the choice of drama as one of the models of the human computer, I disagree with Laurel's distinction between *drama* and *narrative* . We know, in fact from narrative theory that every narrative can be split into two parts: the *story*, that is "what happens to whom," and the *discourse*, that is, "how the story is told" (even this is an artificial or theoretical distinction). In this perspective *drama* is "how the story is told." (This description of Narrative theory has been taken from Kozloff S. *Narrative Theory and Television* in Channels of Discourse, Reassembled, second edition edited by Allen R. C.)

[43] Carey, W. J., Communication As Culture, Essay on Media and Society, UNWIN HYMAN, Boston, 1988, p. 23.

the actual production takes place through an act of concretization"[44] clarifies how it is the happening, the action that characterizes the interaction between a constructed set of information and the person that interacts with them.

If what is written above clarifies the choice of interactive hypermedia, the choice of comparing it with a radio drama came from the experience of working with sound and the fact that I always found fascinating how sound can shape, sculpture, re-create, re-produce, re-define, re-invent an experience. I saw also how difficult it is to create sound for interactive hypermedia. Therefore, I thought that exploring the medium that uses sound exclusively could help to understand how to operate and integrate sound in an interactive environment.

THINKING AND DESIGNING AN AUDIO EXPERIENCE

Visualizing sound

In thinking of audio experience it is important to 'visualize' sounds. I use the verb 'visualizing' because sounds as well as colors have *timbre* that can be consider its tone color, the equivalent of

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[44] Iser, W., The Act of Reading, A Theory of Aesthetic Response, The John Hopkins University Press, Baltimore, 1978, p. 21.

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hue in colors. The timber not only identifies a sound source - reedy, brassy, tympanic - but also sonic qualities such as rich, thin, edgy, metallic. Sound has *pitch* that refers to the highness or lowness of sound and it exercises the function of brightness (called also lightness). *Volume* describes sound in terms of loudness or softness which in color is called saturation or chroma. Sound is much richer than color in fact it has other components such as: *tempo, rhythm, duration, attack, decay.* [45] Visualizing sound allows to think in terms of soundscape. [46] Even though a soundscape consist of events

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[45] These component of the sound structure have been taken from R. S. Alten' s book Audio in Media. I will add here also the definition of Tempo, Rhythm, Duration, Attack and Decay, because they are very important to understand the structure of sound (p. 9)

Tempo refers to the speed of a sound. Fast tempos can produce excitement, acceleration, confusion, etc. while slow tempos may suggest monotony, dignity, or control.

Rhythm, is another extremely important component of sound, it relates to a sonic time pattern, may be simple, constant, complex, or changing. A simple rhythm can convey regularity; a constant rhythm can imply dullness, uniformity; a changing rhythm can create a sense of uncertainty, vigor, or erraticism.

Duration refers how to long a sound lasts. A short sound can convey nervousness, or excitation, a sustained sound can create a sense of peace or persistence.

Attack is the way a sound begins. It can be hard, soft, crisp, or gradual. Hard or crisp attack can suggest sharpness, excitement, or danger. Soft gradual attack can imply something gentle, muted or blase'.

Decay is how fast a sound fades from a certain loudness and it can be quick, gradual, or slow. quick decays can infer interruption, definiteness, closeness while slow decay can convey distance, smoothness, or uncertainty.

All these components are not heard individually but in combination.

[46] Schafer says that soundscape is any acoustic field of study. We may speak of a musical composition as soundscape, or a radio program as a soundscape or an acoustic environment as soundscape.We can isolate an acoustic environment as a field of study just as we can study the characteristic of a given landscape. Schafer, R. M., The

heard not objects seen, it is through the experience of aural perception that we can 'picture' the sound and understand its qualities. It helps also to position sounds using the concepts of background, middle ground, and foreground.

The story

In order to implement the visualization of sound it is important to have a story or a structure on which to coat our sounds.

The radio drama is about the adventure inside the catacombs of two children 12 and 13 years old that are visiting Rome with their parents.

During a visit at the catacombs of St. Callixtus, the two children, while they are waiting for the English tour, discover a open door that brings them down inside the catacombs. The temptation is too big to resist and they sneak in. Equipped with torches they start to explore this mysterious world. Suddenly, while they are looking at a painting on the wall, a mysterious person appears. Scared to death the two kids want to scream but their voice is choked in their throat. The stranger introduces himself as the "Good-Shepherd". Slowly friendship develops between the three. The

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Soundscape, Destiny Book, Rochester, Vermont, 1977, p. 7.

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two kids start to ask questions of the strange man and they discover that he knows a lot. They have not only a special tour, but also the opportunity to assist at a burial, to meet Pope Fabian, to hear the explanation of different traditions that belong to the Christian community. Finally they realize that they have to go back immediately to their parents who are searching for them. Thanks to the special 'magic' of the "Good Shepherd" they find themselves at the starting point. The experience has been overwhelming, but they are already planning to go back. The English tour starts, but it sounds very boring. They know a better way to go around the catacombs.

Shaping characters

If we tell stories it is because we want to invite somebody else to be part of and experience our story; we do not just want to tell them something but we want them to enter in our 'kingdom'. The importance of knowing the 'you' to whom we want to tell the story has never been stressed enough. Called in many different ways such as 'audience', 'target audience', 'market', 'intended reader', 'recipient', 'decoder', I would like to use the terminology '*subject of a constructed experience* '. With this terminology I allow the 'you'

his subjectivity, and therefore the capability of active participation in what will be offered to him to experience. The '*subject* ' interacts with the story carrying all his world, and he reconstructs the experience through the set of instructions that he receives, and by his cultural background that re-manipulates the story itself. '*Constructed experience* ' is any kind of production that through an organized plan, structures an environment, be it acoustic, visual, emotional, cerebral, and more, or all these combined, in order to offer an experience.

The subject can be thought of abstractly; for example in the case I choose to address to children, I can think of kids twelve, thirteen years old, who belong to a middle-class family, living in a mid size town which implies a semi-monotonous rhythm of life where little is going on. They belong to Catholic families, and this implies the knowledge of a set of values that orients their lives. They go to a Catholic school, and this implies that there is an over-structure that orients the whole education system.

These are very important things that are giving us orientation

about demographic and psychographic descriptions of our subject. [47] However they still too generic. Characters of a story need names, feelings, personalities, psychological dynamism, personal goals, actions. This is why I started to think of my characters as real persons. I started with giving them names. Thinking in terms of radio drama I looked for the voice's personality, those timbres that can picture personalities. In directing them it is important to keep the overall pace of the story in mind, but it is also important to shape the rhythm of a single sentence and the connection with the others. The dynamic of the dialogues is the vital element that can decide of the quality of all product.

The main characters: Sarah, Bobby, The Good Shepherd, and the others

Sarah is a thirteen-year-old girl. She is what is called a diligent student, and she likes to make her brother feel ignorant. She is very curious but at the same time suspicious, and she fears for 'what will happen if'. She always gets involved in troubles because of her brother, but even though she doesn't like unplanned

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[47] A more complete view and analysis on demographic and psychographic approach to the audience for production can be found in chapter 7 *The Audience* of Smith, L. D.'s book Video Communication, Wadsworth Publishing Company, Belmont California, 1991, p. 171.

adventures, she is the one that gets more involved when they happen and in the end enjoys them the most.

Bobby is one year younger than Sarah. He likes adventure for its own sake. Whatever is forbidden is a calling for him to go for it. Not excessively brilliant, he is captured by everything that happens; there is no distinction between adventure, dream, and life. Everything is just one big adventure. His desire to explore gets him in trouble many times.

The Good Shepherd is a mysterious person that can appear and disappear. This is definitely the most intriguing property of this person. The second property is his knowledge about the catacombs. No book can give us what he can, because with him the knowledge becomes experience. While he is talking about things, those happen. His voice, warm and smooth, inspires immediate confidence and trust.

The Others are those secondary characters that are functional to the main characters. Their function varies according to the necessity of the main story. Their quality is to be complementary to the development of the action.

The sound frame

For *sound frame* I intend the opening sound and the closing sound that frames any sound production be it radio drama, news, music, song, etc... I think it is of extreme importance in order to gain attention from the listener and keep him tuned in. This sound in a few measures should tell what the rest is about, should establish the mood, and stimulate the desire to continue the experience of listening.

Re-creating the ambient

When I started to think which kind of sound I would have used at the beginning of the radio drama, I tried to imagine the place of the catacombs at the time of the Roman Empire. I had first to clear all the sounds that the centuries and the industrial revolution have brought in our world and that now we have learned to ignore. I pictured an acoustic soundscape mostly silent. This would be very nice but it would be too ambiguous to allow the listener to evoke something ancient. I then thought which instrument could prompt an idea of 'long time ago'. Messing around with a synthesizer I found a wonderful flute. Its sound captured my imagination, and I could picture myself as a shepherd on a hot afternoon sitting under a

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poplar's shadow and, while keeping on eye on my sheep, playing a simple endless melody. [48] The reason it was working was that its timbre with its reedy quality suggested something lonely but at the same time sweet. I chose also to develop the melody with a slow tempo to convey the idea of absence of time, as if something were perpetually there. As a consequence also the rhythm was very simple, and I play over two octaves starting from a high-pitched tone trying to suggest something delicate and gently intrusive, going down to a deeper sound revealing peace but also a sense of mystery that something is going to happen.

A rarefactive carpet of cosmic tones covered the background like velvet. This was used to create the sense of space, giving the suggestion that something is traveling through time.

Constructing the environment

The ambient sound of the catacombs is original and has been recorded by friends [49] in Rome. Its purpose is to establish that the

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[48] Schafer in his book The Soundscape talking about *The Rural Soundscape* says: "Shepherds piped and sang to one another to while away the lonely hours, the delicate music of their songs forms perhaps the first and certainly the most persistent of the man-made sonic archetypes." p. 44.

[49] The ambient sound of the catacombs was recorded by Ottavio Prandini (sound engineer) and Franco Lever (sound designer). The sound were recorded on August, 5th, 1994.

story takes place in Rome, that is 'real' as location, the catacombs. It function is to bridge what seems to be the eternal going of time around us and the personal time of our experience. [50] In the radio drama it has also the function of transition between the adventure that the two kids are experiencing and the situation of the two parents, a distinction between what happens aboveground and underground.

Pace, rhythm and dynamic

Since this piece of radio drama is in its intention an educational prototype, I tried to choose a pace that would allow the eventual students to grasp the contents disseminated along the drama. This has constrained the choice of pace. Pace can affect interpretation in the sense that by slowing down the speed of acting it is possible to make the contents sound monotonous. A corrective to this is to create nuclei of drama in which playing with rhythm and the dynamic of the sound it is possible to break the linearity of the piece. Another strategy that I used was to introduce musical

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[50] In production "Timing means the control and manipulation of both objective and subjective time. Objective time deals with all clock time events of show. subjective time control means that we are more concerned with influencing the duration the viewer feels." From Zettl, H., Sight Sound Motion, Wadsworth Publishing Company, Belmont, California, 1990, p. 277.

transitions that broke the wall-to-wall conversation letting the piece of radio drama breathe. I have also kept two stories interweaved, the two kids' adventure and the parents' anxiety. This allowed me to solve the problem of changing subject and ambient and at the same time to give to the listener a break and reminding that what is going on is happening inside the catacombs.

Structuring a 'polysonic' experience

Sitting in a silent room completely insulated we still hear the heart beat, the breathing lungs and the sound of silence delimited by the size of the structure. It is hard, with what I have described to talk in terms of polyphony with the classical definition as two o more melodic lines that, when played together, for an harmonic whole; however I think we can agree that we live and experience always a polysonic environment. I would like to define 'polysony' as the art of combining sounds in a structured way with the intent of creating or re-creating a precise soundscape.

The radio drama is definitely the apotheosis of polysony. It is not just a question of layering different sounds together, but it is about to combine them in a meaningful relation, that, though not necessarily polyphonic, is however harmonic. It is coating the space

with a touchable texture of sounds. It is closer to architecture than to painting for its capability of sculpturing sounds.

In the catacombs' radio drama, I had to recreate outside ambient and underground environments. I reinvented religious burial, and imperial feelings. The search for patterns of sounds that could 'harmonically' melt together without losing their own personality is the challenge of structuring polysonic experience.

From the mind to the tape

The process of creation of the radio drama includes the use of technology that cannot be regarded as a neutral passive device. it is part of the constructed experience, and it affects the whole process starting with the choice of the tools.

microphone:	Electro Voice	635A dynamic omni-direrectional
tape recorder:	Marantz	PMD222 portable mono cassette rec.
tape recorder:	Marantz	PMD720 4 tracks personal rec. studio
sound processor:	Alesis	Midiverb III 16 bit digital efx processor
synthesizer:	Korg	X3 music workstation
tape recorder:	Fisher	CR-W75H stereo cassette deck

The whole equipment can be considered at the bottom end of the professional quality for a radio drama production.

The use of cassette recorders instead of reel to reel or even better DAT, imposes limitations on the recording section and on the editing process. The actor does not have to much freedom to make mistakes because we can not cut and paste cassette tape; this is crucial, for example, when there is part of a sentence that is perfect another that is not. Reel to reel or DAT allow recording and editing, but with a cassette recorder this is impossible. Even the cuing of the tape can be painful when there is a need for perfect timing.

The Electro Voice 635A, even though is an excellent microphone for on location reporting, has some limits for works where isolation and bass and treble response is critical. Working in a regular room without any kind of insulation, it was not so easy to reach a desired quality of sound. A microphone is an open ear, and it is amazing to discover in the play back how much there is which we do not hear.

Pointing out these limitations does not mean that the result is necessarily low quality. Constraint can be seen as an incentive to creativity. [51] Most of the time, it is not *what* you use but *how* you

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[51] May, R., in his book The Courage to Create, says: "Creativity arises out of the tension between spontaneity and limitation, the latter (like river banks) forcing the spontaneity into the various forms which are essential to the work of art... The significance of limits in art is sen most clearly when we consider the question of form.

use it. Moreover, it could be an interesting point of discussion to analyze the failure of high technology introduced in schools without training teachers or professors on how to the use new technology in its technical functions and in its specific functions. It is not enough to have equipment if we do not know its own language. Most of the time tape recorders have been used to play back music or children's stories; rarely they have been used for production and recreation of scholastic material as a class experience.

With this small production on the catacombs of St. Callixtus I can say that not only it is possible to re-invent ways of presenting material, but also that the use of technology can show aspects of the subject that traditional ways can not explore.

Radio drama is not a substitute for the teacher or a good book, but like any new technology, included interactive hypermedia, is a different way to explore and experience a subject.

After this short panoramic on how I tried to think and design an audio experience I will now to present how I developed the interactive hypermedia.

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form provides the essential boundaries and structure of the creative act." W.W. Norton, New York, 1975.

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THINKING AND DESIGNING AN INTERACTIVE HYPERMEDIA EXPERIENCE

Dealing with complexity

The experience that I have in designing sound production does not have the equivalent in designing interactive hypermedia. If it is true that after this experience I have a better understanding of what interactive hypermedia is about, it also true that the complexity of this new form of art expression takes more than a prototype before becoming comfortable with the process of constructing it.

As I have already pointed out in Chapter Two, talking about the *Nature of the Beast,* the goal of interactive hypermedia is to enable the user to experience complex situations with elegance and simplicity using most if not all of our senses, and as a tool for managing complexity by allowing the user to assemble and manipulate a mass of disparate multi-sensory information elements until they fall into patterns that make sense.

The complex reality that I tried to recreate inside an interactive hypermedia is about the Catacombs of St. Callixtus.

The story

The interactive hypermedia is about the disappearance of

the catacombs from the planet earth. Spread all over the universe they are kept in mysterious structures with other objects that do not belong to the catacombs. The mission is to bring them back. The collection is actuated through participation in a quiz. At the end of the game the user can see what s/he has collected going through a mini-tour that represents different categories of objects such as paintings, symbols, sculptures, epigraph, etc.

The choice of storytelling style is not a second class way to teach about something; rather it allows the articulation of the contents in such a way that it becomes an experience where not only the rational faculties of the brain are engaged but also the emotional component of the person. In this sense the learning experience can be considered more global. Storytelling, however, is not an alternative to other forms of presenting contents; actually I personally think that all forms are complementary to each other, and once they are used in a coordinated context truly they give to the person a richer experience.

The challenge

Structuring an interactive prototype requires that inside the prototype there will be the flavor of the eventual whole final

product; that means that all the ingredients that characterize this particular product should be there.

The web

With this word I refer to the articulation of paths that underlines the navigation. Even though the final product should allow navigation through different universes, the hypermedia prototype develops only one universe.

The main route consists of choosing a **universe**; once the user is inside a universe s/he has the choice of landing on four different **planets**. On each planet there are three **buildings**, in each building there are three **objects**. The objects have been purposely distorted. The user can choose, clicking on one of them, one object at the time. Once s/he has chosen, the object disappears and the user is brought automatically to the question room. There s/he can ask for a 'hint' or answer 'yes' or 'no'. The correct answer gives one hundred points to the user, the wrong answer zero points, and correct answer with the 'hint' request yields only fifty points. No matter which is the answer the user will access the enlargement of the object in his natural representation, a short audio info, and readable information as complementary of the audio section. The learner can, at this point,

go back to selected the building, to the selected planet, to the universe and choose another planet, or back to the universe's area where s/he can land on earth and end the game. Landing on earth brings the user through five different rooms in which, in categories, are collected all the objects that belong to the catacombs. The objects are covered by a mask, and the user can see only those that s/he has collected during his/her journey through the planets.

Shaping the environment

Sound was the tool that gave life to the radio drama. For this interactive hypermedia the main tools have been colors, graphics, scanned pictures, sounds, and motion. The first thing I had to face was the complexity of organizing in a meaningful way this different form of art expression.

The universe

I started designing the universe. During the process of creation went back and thought about the general idea of universe that in eneral is in our mind. First, I had this kind of black dark infinite age of space with tiny blinking dots, a relation that makes you appear, like in those warm summer nights when you lie on your ck and you contemplate the sky and you wonder about the why of

your existence, your nothing inside the emptiness. On the other hand you can feel the presence in yourself of something that goes beyond your limited dimension and that in a certain way fills the entire universe. Second, I started to think of how science fiction has transformed our perception of the universe creating fascinating environments. Third, I tried to think about how a thirteen-year-old student of today would imagine an adventure through the universe.

In the process of creation we start out always from our own experience and vision of the world, at the bottom line of our production we refer to our cultural background. It is our ideology [52] that guides us through the main directions of our work. Since, however, we want to offer our vision and experience to others, we start to play the 'other', we think and fake the detachment from ourselves and we try to be the 'other', the 'you' we want to share our experience with. It is like playing a character in a drama. The more we are able to interpret the 'other' role the easier is the possibility

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[52] I use the word ideology in the sense of ideological culture. Fiske, in is article *British Cultural Studies and Television* in Channels of discourse, Reassembled, by Allen R., talks about 'culture' as a way of living within an industrial society that encompasses all the meanings of that social experience.

On the same tune we can consider Carey when he says: "culture must first be seen as a set of practices, a mode of human activities, a process whereby reality is created, maintained and transformed." Carey J.W., Communication As Culture, UNWIN HYMAN, Boston, 1988, p. 65.

to invite the 'you' in our play.

We look also for general trends that are dictating the general flavor in our societies. In the history of humanity, colors have been used to symbolize certain events, beliefs, and behavior, and these symbolic meanings vary according to cultures and contexts inside the culture. There are definitely trends in colors; you can see them in clothing, magazine covers, record covers, comic books, advertising, etc. Music is another area where trends can establish the success or the failure of a product. The advent of electronic music, for example, has established a completely new way to think of and perceive sound events. It is hard to conceive a science fiction movie without electronic music and special sound effects. The ability to digitize and manipulate images [53] has opened new horizons on composing and presenting reality. Software like Photoshop gives the designer the power of exploring, manipulating and trying

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[53] Scientific American in the number of February 1994 has presented an article written by William J. Mitchell *When Is Seeing Believing?* In the article the author analyzes how digital technology for manipulating images has subverted the certainty of photographic evidence.

It is true that photography has been always considered trustful along with television, and this is because our western culture under the scientific spell still believes that what you see is true. Only recently with the changing of paradigms in science, the emerging theories of chaos, the critical analysis of communication is helping us to look at communication not as simply neutral transmission of data but as cultural interpretation. Technology being a cultural product is part of this process.

extreme solutions before producing the final product. The simulation as a way of reconstructing reality and experiment has opened a big debate around the concept of virtual reality from the technological perspective to the political and ethical one. [54] I will not even try to include the debate in this paper. What, however, I can point out is that my little experience using Photoshop and Painter has not only opened new possibilities of using and manipulating colors but it is the entire way of looking at and approaching painting that is changing. Another important thing to take in consideration is the possibility to copy, cut, paste, and undo things that transforms the computer into an arena of experimentation. If I had to do all my graphics by hand with normal color techniques, and considering all the changes I made along the process, I would probably have ginven up the project a long time ago.

The planets

When I started to design the planets the first thing I was

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[54] I will indicate some of most interesting books I found on Virtual Reality:

Rheingold, H., Virtual Reality, Touchstone, New York, 1991

Heim, M. The Metaphisic of Virtual Reality, Oxford University Press, New York, 1993

Woolley, B. Virtual Worlds, Backwell, Oxford UK & Cambridge USA, 1992

Gelernter, D. Mirror Worlds, Oxford University Press, New York, 1992

Aukstakalnis, S., Blantner, D., Silicon Mirage, Peachpit Press, Berkeley, CA, 1992

Virtual Reality Systems, edited by Earnshaw, R.A., Gigante, M.A., Jones, H., *Academic Press*, San Diego, CA, 1993

concerned with was to create something that would be interesting, appealing, and different. I tried first of all to give a character, a personality to each planet that could make it immediately recognizable. This was done with the choice of colors, and even though I used many colors, each planet has its own color mood. I worked also with the architecture of the buildings. I wanted a specific geometric form that could characterize the planet. I altered perspective trying to create a sense of futuristic construction. The sense of mystery was pursued avoiding the creation of windows or doors that could resemble a normal building. The overall impression would be like looking at monoliths. I also paid attention to the texture of the buildings' walls. This little detail helps to define the consistency of the structure. I also varied the size from building to building. Another problem was to keep consistency and variety in balance. I decided to chose as a constant the number of buildings that the user could see on each planet, three buildings. The colors of the buildings were the same or nuances of the same color. Another element of consistency was the black sky on the background with stars to remind the user that s/he is traveling through space. On each planet there are also streams of colored gas to give the idea

that the user is floating inside the atmosphere of the planet. I tried to create for each planet not only a functional picture but also something interesting by itself.

Inside the buildings

There is a development in the idea of the inside of the building. In the first planet it is possible to observe more consistency in the internal room but also on the internal structures that capture the objects that belong to the catacombs. I devoted particular attention to the positioning inside the screen of the floating structures. Working on a two-dimensional design I tried to create a sense of perspective and depth. I wanted to give to the user the impression that the structures that capture the objects of the catacombs are suspended in the air, magically immobile like the planets in the sky. I changed for each room the shape and the colors of the structures so that each room could be a unique environment compatible with the whole style. The hardest part was to find new shapes that would be unique and interesting at the same time.

The Game

The idea of making the hypermedia into a game has developed slowly. At the very beginning I thought of a kind of navigation in a

three-dimensional environment giving the user full power of navigation and establishing an experience that would be closer to a simulation than a re-interpretation. That created different problems regarding quality of the navigation, the quantity of memory necessary, the full control of the movements, and personally the capability of mastering programming for this kind of experience. It would be interesting to analyze in another experiment to see how much the creative process is conditioned by the kind of chosen medium.

I finally decided to create an experience that would give to the student not a photographic reproduction of the catacombs but an interpretative one, and I thought the best way to do it would have been combining a story and a game. This choice allowed me to be more free in the composition of contents and the organization of the aesthetical elements that I would have used in the design process. There were, of course, some draw-backs. Not using real time navigation has reduced the transitions to a simply going through location to location using visual effects such as iris open, iris close that suggest going in and going out. Losing the fascinating element of controlling movement, it was necessary to stimulate the action

with other elements. Sounds were used to create the sense of traveling and to produce the feeling of being in space. This is the reason for choosing electronic sounds and manipulating some of them. The screen is designed like a control panel of an space-ship, and the user does all the operation from the inside of it. The main goal is not to fight, or accomplish skillful movements with a joy-stick, but rather a journey where the user has to discover the object that belongs to the catacombs. The user is challenged on his/her knowledge instead of his/her sensory response skills. It is a kind of game that is better suited to educational environments as a complementary tool of studying. The value of packaging contents in a game breaks the univocal directionality between teacher and student. The student is invited to participate as a player, allowing the student to release a sense of duty based on formal distinction of roles and stimulating him/her to accomplish tasks in a more participatory and hopefully interesting mode.

We can think of games as the most natural and ancient way of 'simulation'. In each game there is a real or imaginary environment, a purpose, rules, and participants. At the heart of playing there is the desire of experiencing. Games, before challenging the adversary,

challenge the true person that decides to play. They are always based on the deep personal question "what is this about? I want to try."

It is the structure of the game that stimulates the inquiring attitude of the student. It is the uncertainty of the "what next" that stimulates the action of experiencing.

The opening and the closing

At the beginning of the game there is an animation section in which is shown, under the metaphor of a opening spiral, that objects of the catacombs have been scattered in space. There is also a voice that introduces the importance and meaning of the catacombs and is asking the student to help the mysterious voice to bring the catacombs back.

The closing of the game consists of clicking on the planet earth and seeing the total score s/he realized. Then the user is invited to go through five screens in which are collected, under different categories, the objects of the catacombs. During this tour the student can see only the object that s/he was able to collect while the others remain covered with mask. The masks look like abstract paintings; the idea was to have something that would be

interesting to watch by itself. A combination between functionality and elegance, between the part and the whole.

Navigation Control

The most difficult part of organizing the navigation is to decide what is really essential in order to avoid redundancy, that is, making the user to go through unwanted paths that de-motivate or confuse the user. For this reason I decided to give to the user only those elements of navigation that s/he needs in a particular stage of the game. For example at the beginning when the user has to choose which universe s/he wants to explore, there are no other elements on the screen that can suggest alternatives to this choice. The alternatives consist in choosing among universes. On the other hand when the user, after going through the choice of a universe, a planet, and a building, has finally captured an object, s/he has the possibility to go either back to the room or to the planet, to choose another planet or to end the game.

The fundamental elements of navigation of this game are four buttons at the bottom of the screen: 'HYPERJUMP'; 'UNIVERSE'; 'PLANET'; 'BUILDING'.

HYPERJUMP allows the user to go to the main screen where it is

possible to choose which universe to explore.

UNIVERSE presents to the user different planets where the user can land.

PLANET brings the user to a specific planet where there are particular buildings where the objects of the catacombs are kept inside.

BUILDING refers to a specific chosen building. Once the user has ransomed an object through the quiz section s/he can choose to go back to the building to pick up the others.

At the beginning there is a voice that gives to the user the basic direction to start the game. There are also other voices at the opening of any new section that give brief directions so that the user does not get frustrated in doing things that do not work. There is always a trade off between what is strictly necessary and what can be redundant, and this is attained by having in mind the potential user.

Other elements that can help in controlling navigation are feed back sounds and highlighting images. A sound plays when something has been clicked but since sound does not alter the composition of the screen one of the simplest ways to tell the user what s/he has

just done is to highlight the piece of image that as been clicked. The combination of the two gives to the user an efficient way to monitor his/her own action.

Hiding or showing images is another way to tell the user that something happened. I use this technique when the user chooses an object inside the building. The image disappears and a sound is played; this indicates that s/he did something that altered the situation. After that, the user is brought to the question room, the user sees the object that has just disappeared, and s/he has to answer to a question. No matter if the answer is right or wrong, the user will see now a new version of the object, bigger and not distorted. S/he will have also the possibility to hear a small description of the object.

Finally, thinking about navigation for hypermedia should remind us what we do when we go out from our house to do something. What we have to do determines the signals that we look for along streets, buildings, parks, stores, trees, etc. We look only for those indications that can help us to find what we need. In fact, when we are not familiar with the area and there is too much confusion we open a map and look on it for the essential directions.

Hypermedia, on the other hand, helps us to understand better the complexity of our life because it reminds us that we use multi-sensorial navigation. In this Hypermedia on the catacombs we still lack of the dimensions of smell and touch.

CHAPTER IV

METHODOLOGY

METHOD

Production design

A radio drama and an interactive hypermedia experience have been created to test an articulated hypothesis that is based in Carey' s idea of communication as a "symbolic process whereby reality is produced, maintained, repaired, and transformed." [55] In light of this idea the two different media are not seen as juxtaposed but as two different ways to re-interpret and re-construct the experience of visiting the catacombs of St. Callixtus. The use of dramatic structure is not seen as an alternative to a more 'linear' or more 'objective' teaching, but it is a different way of inquiring into and constructing an experiential approach to learning. The two productions are also seen as a set of instructions that, more than expressing meaning by themselves, initiate 'performance' of meanings. As Iser says, "Their aesthetic quality lies in this 'performing' structure, which clearly cannot be identical to the final

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[55] Carey, W. J., Communication As Culture, Essay on Media and Society, UNWIN HYMAN, Boston, 1988, p. 23.

product, because without the participation of the individual 'reader' there can be no performance." [56]

The listener to the radio drama will be engaged in a constructed audio experience that will use the listener's imagination as a stage to recreate what the sounds and the structure of the story are proposing in their development. The sound, in its different forms of speech, music, special effects and silence, and its different functions of information, outer orientation, inner orientation, energy and structure, is the three-dimensional space in which the listener is invited to enter, participate, and share the experience with the characters inside the story.

The user of the interactive hypermedia will be engaged in a constructed adventure. Navigating through universes s/he will 'land' on different planets where objects belonging to the catacombs are kept in mysterious buildings. Some of the objects have been visually distorted to make the game more interesting and at the same time indirectly to reinforce the idea that reality is always experienced inside a contextual frame that is not just the mirror of what is out

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[56] Iser, W., THe Act of Reading, A Theory of Aesthetic Response, The John Hopkins University Press, Baltimore, 1978, p. 27.

there but is an interpretation and reconstruction of it. Some objects are not from the catacombs. The learner will analyze the object deciding whether or not it belongs to the catacombs, thus building a mental structure of criteria for what is in the catacombs. The question can be answered 'yes', 'no', or 'hint'. If the learner ask sfor a 'hint', s/he will be given some information about the object, but s/he will earn half of the points earned by a right answer. Once the user answers the question s/he can access information about the object.

Production Goal

As the title of the thesis indicates, the main goal is to compare the design and impact of dramatic teaching content for radio and hypermedia. Inside this main goal we focus on the properties of sound as a powerful tool to shape and construct experiences, and we sustain that thinking of sound for interactive hypermedia experience, requires a different approach than thinking of sound for radio drama, due to the fact that the user has the power to decide the pace and the rhythm of the action. The arbitrary interruption of the user collides with the essence of sound as phenomenon that develops over time and expresses itself in a

continuum. The problem for designers is to find ways to structure meaningful sound for interactive experience. While we doubt that it is possible to find standard solutions, we are confident that knowing the nature and properties of sound and knowing the complexity of hypermedia design can facilitate the integration of different elements in a well designed structure. The choice of radio drama as comparison, at this point, becomes necessary because radio drama, better that any other form of sound expression, allows for focussed experience of all kinds of sound expression such as speech, music, singing, special sound effects, and natural sounds. These can be used in a linear structure or in a multi-layer structure. Learner responses related to direct engagement, level of enjoyment, experienced feelings, capability of reconstructing or recognizing contents and desire to experience other radio dramas and interactive hypermedia will be the indicators of a well integrated design.

Research subject

These two productions have been designed for subjects between twelve and thirteen years old. No special skills are required even though for the interactive hypermedia some experience with computers and a mouse pointing device will aid the use of the

program, but even inexperienced computer users should be able to navigate the program.

Sample

In order to test the Interactive hypermedia prototype and the radio drama, I will use a convenience sample. The collection of data will be done through questionnaire, personal interviews, and observation.

Subject Population

The test involves minors since the target audience for this production thesis are children between twelve and thirteen years old from St Thomas Aquinas School.

I am a visiting priest at St. Thomas Aquinas parish and occasionally I perform mass for the children at the church; thus, it is likely that many of the children will know who I am. However, the congregation includes more than 2000 families, and the children in the particular class where I will be conducting research are not individually known to me.

Number of subjects

A total of 60 students from St. Thomas Aquinas School divided into two groups of students randomly chosen out of 2 seventh grade

classes will be the subjects for this study.

Written parental consent will be obtained in advance. Children will be given an explicit choice of whether or not to participate.

The first group for the radio drama will consist of all students minus the 20 randomly selected for the hypermedia experience. They will listen to the radio drama and answer a questionnaire. Eight of them randomly chosen will have also a personal interview.

The second group will be also composed of 20 randomly selected students. They will individually use the interactive hypermedia for an average of 15 minutes each and then be asked to answer a questionnaire. Eight of them will be randomly chosen to have also a personal interview. The personal interview will be audio taped for analysis. They will not be stored by the child's name.

There will be no identifiable information about the subject with the questionnaire.

Analysis

Once I have collected the questionnaires and the answers from the personal interviews, I will proceed to research patterns and discrepancies that can help to map an eventual theme in both media.

I will statistically compare the quantitative results obtained from the radio drama with those obtained from the interactive hypermedia experience. Qualitative analysis will derive from listening to the audio tapes.

CHAPTER V

RESULTS AND ANALYSIS

RADIO DRAMA TEST

Radio Questionnaire

The radio questionnaire consisted of 31 questions covering four areas. The first area was about enjoyment, the second area was about feelings, the third area was about content, and the fourth area is about four questions that cover how easy it was to do something and how much they liked something..

What I am presenting here are the results of each question divided in the four areas and illustrated with a graphic. A general comment integrated with the answers obtained from the personal interviews and some notes from my personal observation during the test will follow each area.

General guidelines

For the questionnaire I have used rating scales and multiple choice questions. Examples:

- How much did you enjoy listening to the radio drama?

Not at all 1 2 3 4 5 Very much

- Which of the following objects belong to the catacombs?

candle marble-slab electric lamp coffin

The radio drama test took place in a regular class with three different groups, at three different times, so as not to interfere with the students' main activity.

The reason why I asked for a regular class to test the radio drama is that the production has been thought of as educational material for a regular class. I have also used a portable tape recorder Panasonic S-XBS that matches what normally is available in a school. The students were seated in regular desks, I tried to vary as little as possible the general environment of the students.

Even though there was noise coming from other classes' activity, the sound was clearly audible and intelligible. In order to influence at minimum the students, I always assisted at the tests from the back of the class leaving the students facing the tape recorder. Before starting the test each student was invited to read the consent form and sign it as an agreement of participation. The only direction that was given was that they were going to listen a radio drama project and that at the end they were asked to answer a questionnaire.

The number of students randomly chosen for the radio drama

test were forty; however the day of the test (November 21, 1994) two of them did not want to participate and another two were sick. The test took place with thirty-six of them.

AREA OF ENJOYMENT

- If 1 is Not At All and 5 is Very Much, please circle how much did enjoy listening to the radio drama?

Not at all		
1*	1	2.7%
2***	3	8.3%
3**********	21	58.3%
4*********	9	25.0%
5**	2	5.5%
Very much		

- How much did you enjoy the character of Sarah?

Not at all		
1***	3	8.3%
2***	3	8.3%
3**********	10	27.7%
4**********	13	36.1%
5*******	7	19.4%
Very much		

- How much did you enjoy the character of Bobby?

Not at all		
1**	2	5.5%
2*******	7	19.4%
3**********	10	27.7%
4**********	13	36.1%
5****	4	11.1%
Very much		

- How much did you enjoy the character of the Good Shepherd?

Not at all		
1*	1	2.7%
2****	4	11.1%
3******	6	16.6%
4******************	18	50.0%
5*******	7	19.4%
Very much		

- How much did you enjoy the sound of the voices?

Not at all		
1*	1	2.7%
2****	4	11.1%
3*****	5	13.8%
4********	8	22.2%
5******************	18	50.0%
Very much		

- How much did you enjoy the other sounds?

Not at all		
1*	1	2.7%
2		
3****	4	11.1%
4**********	11	30.5%
5********************	20	55.5%
Very much		

- How much did you enjoy learning about the catacombs of st. Callixtus by having an adventure?

Not at all		
1**	2	5.5%
2****	4	11.1%
3********	8	22.2%
4**************	14	38.8%
5********	8	22.2%
Very much		

My hypothesis was that structuring sound we can create experience. Looking at the results we can say that the sound of the voices and the other sounds have played a very important role in making the radio drama enjoyable. This is supported also by the personal interviews where to the question "How did you evaluate the overall experience?" the general answer was that they enjoyed it very much because the sounds were different, and the voices were acted out very well. Only one person out of eleven interviewed did not like the performance of the voices. Another reason for the enjoyment was the way in which the material was presented, not just a sequence of facts but as a story.

I would like to point out why, in my opinion, the "good shepherd" had a high preference. His voice was the only professional voice I had. This indicates how important it is to have good voices that not only have a good timbre but that know how to deliver the message in a living way. On the other hand, not always is it possible to have professional voices. The alternative is to have a clear idea of what we want to get from the story, and a discrete experience in listening to other programs so we can have at least a perception of what can work.

My hope is to see teachers that will start to experiment new ways of teaching using the technology not as an alternative or as substitution but as part of the teaching process in which the new technology is integrated with the scholastic activity. As the results confirm the students have sensibly appreciated the chance to learn in a creative way. I think that most of the time it is not a question of lack of new material, but rather a lack of vision of new ways to present scholastic material that prevents an enjoyable experience.

AREA OF FEELINGS

- How much did you feel a sense of adventure?

Not at all		
1*******	7	19.4%
2*******	7	19.4%
3****	4	11.1%
4**********	11	30.5%
5*******	7	19.4%
Very much		

- How much did you feel a sense of mystery?

Not at all		
1****	4	11.1%
2********	8	22.2%
3*******	7	19.4%
4**********	10	30.5%
5*******	7	19.4%
Very much		

- How much did you feel a sense of surprise?

Not at all		
1***	3	8.3%
2**********	11	30.5%
3**********	13	36.1%
4*****	5	13.8%
5****	4	11.1%
Very much		

- How much did you feel a sense of fun?

Not at all		
1******	6	16.6%
2*****	5	13.8%
3**********	13	36.1%
4******	6	16.6%
5******	6	16.6%
Very much		

- How much did you feel a sense of traveling?

Not at all		
1****	4	11.1%
2***	3	8.3%
3******	6	16.6%
4**********	10	27.7%
5**********	13	36.1%
Very much		

- How much did you feel a sense of being underground?

Not at all		
1***	3	8.3%
2**	2	5.5%
3***	3	8.3%
4******	6	16.6%
5**********	22	61.1%
Very much		

- How much did you feel a sense of being in empty space?

Not at all		
1*****	5	13.8%
2*****	5	13.8%
3******	6	16.6%
4*********	9	25.0%
5**********	11	30.5%
Very much		

- How much did you feel a sense of discovering?

Not at all		
1**	2	5.5%
2****	4	11.1%
3********	8	22.2%
4**********	11	30.5%
5**********	11	30.5%
Very much		

- How much did you feel a sense of being in a spaceship?

Not at all		
1**************************	26	72.2%
2*****	5	13.8%
3***	3	8.3%
4*	1	2.7%
5*	1	2.7%
Very much		

- How much did you feel a sense of learning ?

Not at all		
1*	1	5.5%
2		
3**************	14	38.8%
4**********	11	30.5%
5**********	10	27.7%
Very much		

Feelings are often put on a secondary place when it comes to learning. However, part of hypothesis in using structured sounds in order to recreate an experience was that sound is able to stimulate feelings and emotions due to the physical dimension of sound that can interact directly with our body.

In this area we can notice interesting results. The most obvious feeling was being underground. From the interview it is clear that this was due to the use of the echo effect. I used it purposely because the simple imitation of the sound in the catacombs does not have any echo but we associate echo with large ambient and underground ambient. This is reminding us how is important to clarify and intensify the experience while constructing an artistc event. To reproduce reality does not help to understand it and appreciate it.

It was very satisfying to see the result about the sense of learning, also confirmed by the answer in the section specifically dedicated to the catacombs of St. Callixtus. From the interviews this is attributed to the fact the material covered was structured in a story and that the sounds were different and organized in a interesting way. I think this validates the idea that storytelling can

be a powerful tool to convey content. Moreover, it is only creating multiple points of view that we can teach and learn to appreciate the complexity of our life.

A good result was the feeling of being in a spaceship. Almost 94.3% in the three lower levels of preference testify that they did not have any sense of being in a spaceship. The selection and the structuring of sounds, like the selection of words and paragraphs in a story, becomes the structure of the story, the invisible direction that helps to interpret the event.

Discrete is the result of 'sense of traveling'. Grouping the responses from three to five level of preference, more than 80% of the students had a sense of traveling. From the interview this was attributed to the use of foot steps at the beginning, and the sound transitions from one experience to the other.

Less clear are the results from the question about the 'sense of adventure'. Even though, almost 60% of the students as express a positive feeling still there is a almost 40% that did not have almost or any sense of adventure. My inference is that the unit was heavily loaded with content that probably in some parts slowed down the dynamic of the story. However this unit has been thought as part of a

mini series on the catacombs; eventually units can be developed that are more dynamic and lighter on content.

My conclusion in this area is that sound did help to create and experience feelings. That is why for me it is important to re-educate ourselves to a new appreciation of listening. One of the thing that I could observe during the test, was that rarely did a student stay more than one minute without moving or doing other things while s/he was listening. It might be a question of age, but I would like to provoke a reflection saying that it is also a cultural attitude. It is our highly visually oriented society that has reduced our capability to listen to the 'you'. We are too busy with the 'I'to pay attention to the 'you', and I believe that our body expresses this.

AREA OF CONTENT

- Where do you think the catacombs of St. Callixtus are?

-Madrid			
-Rome	**********	36	100.0%
	**********		
-London			
-New York			

- How old do you think the catacombs are?

- 500 years			
-1000 years	**	2	5.5%
-1500 years	**********	14	38.8%
-2000 years	**********	20	55.5%

- Who do you think has built the catacombs?

-The Romans	****	4	11.1%
-The Pagans			
-The Christians	********** **********	30	83.3%
-The Greeks	**	2	5.5%

- Which was the principal function of the catacombs?

-Meetings	**	2	5.5%
-Business	**	2	5.5%
-Burial	********** **********	28	77.7%
-Worshiping	****	4	11.1%

- What do the Catacombs look like?

-Museum			
-Underground-Labyrinth	**********	19	52.7%
-National Park			
-Cavern	**********	17	47.2%

- Which of the following paintings belong to the catacombs?

-Guernica by Picasso			
-Mona Lisa by			
-Leonardo da Vinci**		2	5.5%
-Good Shepherd by Anonymous 2nd century	**********	34	94.4%
-Marilyn Monroe by Andy Warhol			

- Which of the following sculptures belong to the catacombs?

-Statue of Liberty*		1	2.7%
-Statue of St. Cecilia	**********	27	75.0%
-David of Michelangelo********		8	22.2%
-Washington Monument			

- Which of the follow objects belong to the catacombs?

-candle	******	6	16.6%
-marble-slab	**********	18	50.0%
-electric lamp			
-coffin	**********	12	33.3%

- Which of the following symbols is typical of the catacombs?

-swastikas			
-fish	**********	36	100.0%
-star of David	**********		
-rainbow			

Even though the main goal of this research did not have a specific content-oriented goal, I wanted to fathom the capability of a radio drama to provide information in such a way that could be

considered a reliable tool for teaching. As I said in chapter four, I do not consider radio dramas the only way or the only alternative to present scholastic material. My thesis wanted to be a comparison between a radio drama and an interactive hypermedia not in order to establish which is the best, but to illustrate that each one has its own specific nature and personality and choosing one means to think and organize material and experience in a totally different way than choosing the other.

The result are very satisfying. Only three questions present a certain degree of ambiguity. The first, is the one that asks the age of the catacombs. The problem is in the questions. In fact, if we consider that the catacombs started as activity around the beginning of the second century and was protracted to the beginning of the fifth century we can see the ambiguity of the question. The second, regards what the catacombs look like. Since there was nothing to describe the intricate net of tunnels, it might be possible that the echo sound effect was associated with something more familiar. A cavern is a subject of many movies and cartoons, I presume that was the most reasonable choice. Probably, if I had used the expression 'underground labyrinth of tunnels', it would have been less

ambiguous. The third, is about the objects that belong to the catacombs. Even though, candle and coffin were not mentioned, in the radio drama, but rather *"the bodies were placed inside, wrapped simply in a sheet or shroud. The corpse might have been sprinkled with scents. After the burial the loculus was closed with tiles, bricks or thin marble-slabs, and a small oil lamp was placed beside the tomb. Look there and you will see...."*, I think that the student envisioned the burial with the elements that are used today in a christian burial. In fact, anybody who has never seen an oil lamp, can hardly imagine the different between a candle and a oil lamp considering the fact that there are candles that use liquid wax. The coffin is the place where the dead person is replaced, probably the easiest association with the catacombs, the place where the Christians buried the dead.

I think the rest of the results do not need too many interpretations or comments except the recognition that radio drama can truly be a tool to organize, structure and offer experience rich in feelings and content.

AREA OF VARIOUS SKILLS

- How easy was it to imagine what the catacombs are like?

Not at all		
1**	2	5.5%
2******	6	16.6%
3********	8	22.2%
4*******	7	19.4%
5**********	13	36.1%
Very much		

- How much did the sounds help you to imagine what was going on?

Not at all		
1**	2	5.5%
2***	3	8.3%
3********	8	22.2%
4**********	10	27.7%
5**********	13	36.1%
Very much		

- How much did you like the story?

Not at all		
1*	1	2.7%
2*****	5	13.8%
3*********	9	25.0%
4**********	16	44.4%
5*****	5	13.8%
Very much		

- Would you like to listen to another radio drama about the catacombs?

yes	**********	23	63.8%
no	**********	13	36.1%

- Would you like to visit the catacombs some day?

yes	**********	34	94.4%
no	**	2	5.5%

This section is dedicated to an overall view of the experience. It is part of producing something that not everything will be covered or done in a satisfactory way, but it is also important to recognize that at the end of any experience is the overall feeling that can makes us come back or refuse any other experience. The reason why many kids drop out of school is not necessarily and exclusively related to low I.Q. or social status, but it is related also to an overall unsatisfactory experience. Studying did not have any taste for them.

The fact that 36% of the students would not like to listen again a radio drama does not say that radio drama is a failure, but simply that those students probably need another way to approach the topic of the catacombs. On the other hand the other 63% that would like to listen to another radio drama may have found an interesting way to approach a topic like the catacombs of St. Callixtus.

A positive result about the sound confirms the capability of

this medium to express action and complexity of the drama. It is also interesting to notice the power of imagination that the sound is able to evoke from the listeners. During the personal interviews I asked how they have pictured the catacombs. These are a series of adjectives that the students used to describe them: very interesting, very old, dark, spunky, wet, mystic, brown, black, empty, grey, and gloomy. This confirms that sound has the property of color--I would say sound is a colored experience.

Another interesting result is the answer the students provided when I asked them how they visualized the 'Good Shepherd'. This is the most common description of him: almost everybody thought he had a beard and long hair. The differences were in the color: blond, white, or dark. The majority said he was dressed with a robe or a cape, he had also sandals. Some were so precise as to say that he was 6.2 feet and he had blue eyes. Almost everybody had a good felling and felt he was very friendly. Somebody said that he pictured him like Jesus.

Definitely we can argue that these images are triggered mostly by a Christian iconography, however, the fact is that the sound was able to evoke very specific components that narrowed

down the possibility of a confused image, and it directed the association process toward the person that was implied in the Good Shepherd, Jesus.

HYPERMEDIA TEST

Hypermedia questionnaire

The hypermedia questionnaire was modeled on the same structure of the radio questionnaire. It consisted of 36 question covering areas of enjoyment, feelings, easiness, and content.

For the presentation of the results I will follow the same procedure revealed in the radio questionnaire.

The test

The test took place in a small room used generally for meetings. The ideal place would have been the computer room, but the scheduled time was conflicting with other activities. I used my Macintosh Centris 610 since the application was built with this machine, and I knew its advantages and limits. I chose also not to have any external speakers since none of the computers in the lab are equipped for multimedia experience, and because I think that if something works at the lowest level it definitely will work at the highest. Moreover, the majority of students that I interviewed have only a regular computer without external speakers

I chose also to test two students at the time because it reflects more closely the way in which students are using computer

in schools right now. Since rarely are there computers for the all class, students often work in teams. Personally I think is a better way to interact with the computer and with friends and helps to develop a sense of collaboration.

The test took place in two sections November 28, and November 29, 1994 in order not to interfere with school activity.

The students were invited to play the game for fifteen minutes and then answer a questionnaire.

AREA OF ENJOYMENT

- How much did you enjoy playing this game?

Not at all		
1		
2**	2	10%
3**	2	10%
4**********	12	60%
5****	4	20%
Very much		

- How much did you enjoy exploring the universes?

Not at all		
1		
2*	1	5%
3****	4	20%
4******	6	30%
5*********	9	45%
Very much		

- How much did you enjoy the sound of the voices?

Not at all		
1		
2***	3	15%
3*	1	5%
4***	3	15%
5**********	13	65%
Very much		

- How much did you enjoy the other sounds?

Not at all		
1		
2*	1	5%
3*	1	5%
4**********	10	50%
5********	8	40%
Very much		

- How much did you enjoy finding the objects that belong to the catacombs?

Not at all		
1		
2		
3*****	5	25%
4********	8	40%
5*******	7	35%
Very much		

- How much did you enjoy the graphics of the planets?

Not at all		
1		
2		
3*	1	5%
4*****	5	25%
5**********	14	70%
Very much		

- How much did you enjoy learning about the catacombs of St. Callixtus by having an adventure?

Not at all		
1		
2		
3******	6	30%
4*******	7	35%
5*******	7	35%
Very much		

- How much did you enjoy the opening of the game?

Not at all		
1		
2**	2	10%
3***	3	15%
4**********	12	60%
5***	3	15%
Very much		

- How much did you enjoy how the game ends?

Not at all		
1		
2****	4	20%
3***	3	15%
4*******	7	35%
5******	6	30%
Very much		

The overall view of this area is very positive. The majority of students have expressed a general enjoyment of the experience. This was also confirmed by the interviews where everybody expressed a general enjoyment, and the reasons they offered were that the experience was fun, different, offered a possibility to learn about

religion in an interesting way, gave them the possibility to explore and pick up objects, and gave them a sense of exploring.

At the top of the preference were the graphics of the planets. This is important because a big part of an hypermedia experience is what you see. Our taste in terms of pictures and graphics has reached a high point of sophistication due to the high quality images that each day we receive through television and magazines and this calls for accuracy and elegance in structuring the screen. Half of the interviewed students pointed out the graphics as the thing they liked best and most of the time the reason was that they were different, very colorful, and interesting. Not always the students were able to articulate the reason why they liked something or not, but definitely they knew what they liked or not.

Second in order of preference were sounds in general and the sound of voices. This hypermedia experience is heavily imbued with sounds, and the risk is that the sound can become annoying. Through the personal interview I could find out that generally the voice delivering information was appreciated very much, while the voice giving instruction was for some irritating because it was too distorted. The use of special effects in manipulating voice is always

a two-edged sword, because it makes voices interesting but sometimes it impedes understanding. The students, however, enjoyed very much the musical transition going from one screen to the other.

At the third level of enjoyment is the finding of objects that belong to the catacombs. This was explained during the interview as the possibility of making choices, to act on the object and see them react. Action and reaction seem to be at the heart of engagement, I would say that is the happening that establishes the connection between the constructed experience and the user.

The fourth element worthy of comment is the enjoyment of exploring universes. This element is one of the most important and will be confirmed and supported by the results in the second area about the sense the students had of discovering. It is important because the overall structure of this game is the experience of exploring and discovering lost objects and bringing them back.

AREA OF FEELINGS

- How much did you feel a sense of adventure?

Not at all		
1*	1	5%
2****	4	20%
3********	8	40%
4****	4	20%
5***	3	15%
Very much		

- How much did you feel a sense of mystery?

Not at all		
1*	1	5%
2*	1	5%
3******	6	30%
4***	3	15%
5**********	9	45%
Very much		

- How much did you feel a sense surprise?

Not at all		
1*	1	5%
2**	2	10%
3*****	5	25%
4*******	7	35%
5*****	5	25%
Very much		

- How much did you feel a sense of fun?

Not at all		
1*	1	5%
2*	1	5%
3*	1	5%
4*********	9	45%
5********	8	40%
Very much		

- How much did you feel a sense of traveling?

Not at all		
1*	1	5%
2**	2	10%
3***	3	15%
4*****	5	25%
5*********	9	45%
Very much		

- How much did you feel a sense of been underground?

Not at all		
1***	3	15%
2*******	7	35%
3*******	7	35%
4**	2	10%
5*	1	5%
Very much		

- How much did you feel a sense of been in empty space?

Not at all		
1***	3	15%
2**	4	20%
3********	8	40%
4****	4	20%
5***	3	15%
Very much		

- How much did you feel a sense of discovering?

Not at all		
1*	1	5%
2*	1	5%
3**	2	10%
4*********	9	45%
5*******	7	35%
Very much		

- How much did you feel a sense of being in a spaceship?

Not at all		
1*****	5	25%
2***	3	15%
3*****	5	25%
4****	4	20%
5***	3	15%
Very much		

- How much did you feel a sense of learning ?

Not at all		
1		
2**	2	10%
3**	2	10%
4****	4	20%
5**********	12	60%
Very much		

This section, like the one in the radio questionnaire, covers the feelings the students had interacting with the medium.

I was happily surprised when I saw that among the feelings the one which received the most positive response was the sense of learning. This is important for two reasons: the first that this hypermedia experience was thought and designed with an educational purpose, and this seems to be achieved. Second, it confirms the belief that new generations do not get lost in a non-linear approach, but rather they can enjoy the playful aspect of the game and the academic dimension of the content.

With almost equal response we have at the second place the

sense of traveling, discovering, mystery and fun. I'm glad to see these feelings grouped together because they represent the basic condition of a game. There is something to be reached which is hidden (sense of mystery); therefore we need to do something in order to discover what the hidden object is about (sense of discovering and acting). In this case the acting part was traveling through one planet to the other or from room to room. If the whole is enjoyable the result is that in doing this the person has fun.

Perhaps there is something to learn about our life and society, too often so serious and committed to winning the game that it has lost the pleasure of playing it. It might be that hypermedia experience especially if experienced in teams, will teach us a better way of enjoying the "happening" instead of the "results" of the happening.

During the personal interview the students pointed out how the sound had a big role in conveying the sense of traveling and the sense of mystery, even though not all the sounds were equally interesting and suggestive. This is another problem in structuring interactive hypermedia: not only is it a different approach to a topic that involves non-linearity, and a multi-layered structure, but also

it requires maintaining quality in all these different leves and dimensions. In radio or television experience teaches that creativity is inversely proportioned to the length of the product and that keeping the quality along the whole event is not a easy task. In an interactive and non-linear environment the complexity develops logarithmically.

AREA OF CONTENT

- Where do you think the catacombs of St. Callixtus are?

Madrid *		1	5%
Rome	**********	18	90%
London			
New York *		1	5%

- How old do you think the catacombs are?

500 years *		1	5%
1000 years *		1	5%
1500 years	**********	10	50%
2000 years	********	8	40%

- Who do you think has built the catacombs?

The Romans	*****	5	25%
The Pagans	**	2	10%
The Christians	**********	11	55%
The Greeks	**	2	10%

- Which was the principal function of the catacombs?

Meetings			
Business			
Burial	**********	12	60%
Worshiping	********	8	40%

- What do the Catacombs look like?

Museum	****	4	20%
Underground Labyrinth	*********	9	45%
National Park			
Cavern	*******	7	35%

- Which of the following paintings belong to the catacombs?

Guernica by Picasso	**	2	10%
Mona Lisa by Leonardo da Vinci			
Good Shepherd by Anonymous 2nd century			
**********		16	80%
Marilyn Monroe by Andy Warhol	**	2	10%

- Which of the following sculptures belong to the catacombs?

Statue of Liberty	*	1	5%
Statue of St. Cecilia	**********	13	65%
David of Michelangelo	******	6	30%
Washington Monument			

- Which of the follow objects belong to the catacombs?

candle	*****	5	25%
marble-slab	******	6	30%
electric lamp	*	1	5%
coffin	********	8	40%

- Which of the following symbols is typical of the catacombs?

swastikas	*	1	5%
a fish	**********	16	80%
star of David	**	2	10%
a rainbow	*	1	5%

Analyzing this area needs to take into consideration that the students had only fifteen minutes to play with the game, and for the majority that implied the discovering of an average between only five and nine objects, and some of them did not belong to the catacombs. This could be tracked because at the end of the game the students could see the global result of the their score and that was automatically recorded in a file. The average of the score was between 200 and 400 points, considering that most of them used the function "HINT" that gives only half points and that at least they made one or two mistakes.

I made this explanatory introduction because if we compare these results with those from the radio test the temptation is to consider radio drama a better way to convey content. The problem however consists in understanding the different nature of the two media. The radio drama was a thirteen-minute experience in which everything was there, while here the fifteen minutes experience was

only a part of what could be explored. Moreover the quantity of content is differently organized. In the radio drama the content flows in an organic and linear way that is imposed by the structure of the drama, while in the hypermedia the content is put together in a non-linear way and the structure becomes the path the user has followed. This can teach us that certain topics or content can be better and more easily experienced in one medium that in another, but this does not say anything about the superiority of one form of expression over the other. The two media are two different languages, therefore two different ways to look at the world.

With these considerations, the results in the content section are very good. During the interview one of the problems that came out was that they had a hard time locating exactly where the catacombs were, and they had to infer and use other sources of information to establish the location. If this can be considered a draw-back, at the same time it is good to see how the process of interaction with something not completely plain and flat causes the students to develop other strategies and look for other sources of information.

AREA OF EASINESS

- How easy was it to imagine what the catacombs are like?

Not at all		
1**	2	10%
2*	1	5%
3********	8	40%
4*****	5	25%
5****	4	20%
Very easy		

- How easy was for you to move from place to place?

Not at all		
1		
2*	1	5%
3***	3	15%
4********	8	40%
5********	8	40%
Very easy		

- How easy was to collect catacombs objects?

Not at all		
1*	1	5%
2******	6	30%
3*******	7	35%
4***	3	15%
5***	3	15%
Very easy		

- How easy was to understand what the voices said?

Not at all		
1***	3	15%
2**	2	10%
3***	3	15%
4*****	5	25%
5*******	7	35%
Very easy		

- How easy to recognize if a object was from the catacombs or not?

Not at all			
1			
2	******	6	30%
3	*******	7	35%
4	******	6	30%
5	*	1	5%
Very easy			

- How easy was to understand the game?

Not at all			
1	*	1	5%
2	*	1	5%
3	*******	7	35%
4	**	2	10%
5	*********	9	45%
Very easy			

- Would you like to play another game about the catacombs?

yes	**********	16	80%
no	****	4	20%

- Would you like to visit the catacombs some day?

yes	**********	17	85%
no	***	3	15%

The comments on the preceding area of content apply also to this area. Fifteen minutes gave them just a flavor of the game. However it can be noticed that the logic of the game was one of the easiest things to understand. I think in an educational interactive

hypermedia the balance between the logic of the game and the content is very important. If the attention is absorbed mostly in trying to understand how the game works, retaining the content is at great risk. It is like watching a movie in another language and following the subtitles. At the end you miss both action and content. On the other hand if the game is too easy, it is like a musician being asked to play "Frere Jacques". After a little while boredom penetrates the veins.

One of the advantages of interactive hypermedia is that it is possible to structure different levels of difficulties. In this prototype that explores only one universe there is only a degree of difficulty, but one can imagine developing the rest of the game on higher levels of difficulty.

Also the navigation 'moving from place to place' was found very easy and intelligible. Considering that one of the goals in designing computer interface is to make the interface transparent and invisible, navigation needs to be simple and functional. The students interviewed appreciated the fact that the buttons of navigation had icons and names so that it was easier to recognize the function.

Probably the hardest part of the game was to recognize if an object belonged to the catacombs or not. Some of those interviewed said that they did not have any clue, and even the 'hint' did not help enough. Therefore the suggestion was to make more 'hints' or to give other clues. However, everybody enjoyed the fact that no matter what was the answer, right or wrong they could access the information.

Finally, the fact that 80% of the students expressed the desire to play another game on the catacombs and possibly to visit them, indicates that in spite of what one student defined as 'a boring subject' the way in which it was experienced and perceived was highly positive and a stimulant for further explorations.

In the next page I present the average of the areas of enjoyment, feelings, and skills between the radio drama and the interactive hypermedia. Even though the interactive hypermedia has a higher average, that does not mean that the radio drama was unsuccessful; the two experiences are different in their nature. However, we can hypothesize that the combined use of both media would give the students a more global experience. The future of education should bring us to what Rajneesh so marvelously calls

'democracy of the senses'.

AVERAGE

	RADIO	HYPERMEDIA
ENJOYMENT	average	average
Enjoy listening to radio drama	3.22	3.90
Enjoy character of Sarah	3.50	
Enjoy character of Bobby	3.28	
Enjoy Good Shepard	3.72	
Enjoy sound of voices	4.06	4.30
Enjoy other sounds	4.36	4.25
Enjoy learning by having an adventure	3.61	4.05
Enjoy exploring universes		4.15
Enjoy finding the objects		4.10
Enjoy graphics of planets		4.65
Enjoy opening of game		3.80
Enjoy how game ends		3.75
FEELINGS		
Feel sense of adventure	3.11	3.20
Feel sense of mystery	3.22	3.90
Feel sense of surprise	2.89	3.65

Feel sense of fun	3.69	4.10
Feel sense of being underground	4.17	2.55
Feel sense of being in empty space	3.44	3.30
Feel sense of discovering	3.69	4.00
Feel a sense of being on a spaceship	1.50	2.85
Feel a sense of learning	3.81	4.30
Feel a sense of traveling		3.95
SKILLS		
Easy to imagine	3.64	3.40
Sounds help you imagine?	3.81	4.15
Like the story how much?	3.53	
Like to listen or do to another?	64%	80%
Like to visit Catacombs	94%	85%
Easy to collect objects		3.05
Easy to understand voices		3.55
Easy to recognize if object from CC		3.10
Easy to understand game		3.85

CHAPTER VI

CONCLUSION

THE USUAL

Words

In many theses, this should be the part were conclusions are drawn and eventually suggestions are made. Generally the conclusions say that the experience, experiment or research has been satisfying and that, however, it needs further development and inquiring. The suggestions or recommendations regard the limits or flaws in the project so that in case of further development they could be avoided. I will present here a quick summary of the purpose of this project, and I will express some personal reflections in order to raise further questions rather than to deliver answers.

The purpose

This thesis had a multi-layered purpose. The general goal was to compare dramatic teaching content inside a radio drama and an interactive hypermedia design. The comparison was focused on the analysis of how to use specific elements that constitute a radio drama and an interactive hypermedia in order to construct a successful experience. An indirect, but nevertheless important,

purpose, was to point out the different and specific nature of the two media, in particular, the complexity of interactive hypermedia that challenges our traditional way of thinking, approaching, and experiencing reality. Both radio drama and interactive hypermedia have been produced in a prototype following the theoretical bases of the two media.

The radio drama

Sound is the discriminative element of radio. The thesis tried to present it as an existential and physical experience, fathoming its properties and functions. The result showed that sound is a powerful event that can be structured in soundscapes that become the texture for a sonic experience.

Radio drama can be considered as architecture of sound where sound events are shaped and sculptured creating meaningful paths and routes for the listener.

The test of the radio drama on the Catacombs of St. Callixtus has shown its capability of offering an educational and enjoyable experience to the students. Beside the results from the questionnaire I would like to report comments from two of the interviewed students: "*It was interesting to learn something that*

usually you do not enjoy and is boring. I think if they would make more interesting things it would be better."

"I did like it because it was different, this was really good and different from what I usually do. I liked the material that was covered, and the way in which it was presented."

Interactive Hypermedia

Complexity, polyphony, connectivity and interactivity govern the interactive world. The ingredients of an interactive hypermedia need to be shaped and structured in harmony with the whole experience. Even action, per se, does not make sense if not part of the whole event that underlies the hypermedia purpose.

The hypermedia on the Catacombs of St. Callixtus was born with an educational intent, and shaped and presented in a story game format. Images, sounds, graphics, and navigation were structured in order to create the experience of a journey in which the sense of adventure, discovering, learning, enjoyment, mystery should have been the result of the interaction between the user and the designed experience.

The test on the interactive hypermedia shows that the design of the Catagame has been satisfying. This is how two interviewed

students have evaluated the experience.

"*It was interesting, because you have to go to different places, discovering things, pick up objects.*"

"*I thought it was kind of fun because you can learn about your religion in a fun way, and it is more like a space travel and you do not realize that you are learning.*"

Finals Consideration

Over the past 50 years educational technology has evolved from its emphasis on the protection and use of media instruments of communication to its current concern with the systematic approach to solving educational problems based on theories of learning and instruction. This time has been heralded as a major breakthrough with a potential for revolutionizing education.

In the early days media (and to some extend computers today) were viewed as solution looking for a problem rather than the other way around. The mystique which surrounds the new technologies causes enthusiasts to try to apply them in almost any setting without however, rasing the "right" questions. It is far better to define and describe the problems facing a country, an organization or an individual and *then* consider alternative solutions which may

involve technology.

In the 60s it was realized that real improvement of education could not be attained by focusing on independent parts of the system. Instructional methods or modes of presentation could not be replaced by machines and/or methods in vogue without real changes in the configuration of the educational system. Curricular materials (including all types of media), teaching strategies and teaching philosophy are so interrelated and interconnected that one cannot change one without changes in the others (Fullan, 1985). Inspired by developments of other disciplines, like engineering and management science, a holistic approach gradually developed, i.e., a problem cannot be isolated by from its context or environment, but has to be analyzed in that context or environment. It is not self evident that every problem in education or training should be solved by using media or even by using new instructional strategies. [57]

What might be viewed as a failure to install many of the instruments and artifacts of educational technology might in fact be a sign of maturity, a sign that advocates we have learned what

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[57] Ely, D.P. and Plomp, T. *The Promises of Educational Technology: A Reassessment* in Computers in the Human Context: Information Technology, Productivity and People, edited by Forester, T., The MIT Press, Massachusetts, 1989, p. 250.

proper role of educational technology really is. In a world where the products of a technological age are visible in many sectors of society, it is reasonable to think that these fruits of our labors are potentially useful in the educational sector as well. We have learned that we must buy products that have been originally designed for other purposes and adapt them to educational settings. We have learned that educational technology is a problem-solving process, not a product. Now, the current innovation is information technology or, more specifically, the computer. What will happen in the future? Will the mistakes of the past be repeated? Worldwide problems in education still exist, and the urgent calls for a "quick fix" are creating pressure to embrace new technologies. The basic structures of education are the same, and most teaching continues to be offered in classrooms with groups of learners being taught by an individual teacher. This age-old practice is probably the single most effective deterrent to improvements in learning. Until educators realize that new times demand new configurations for teaching and learning, we will continue to find pockets of innovation which may or may not make much difference to the advancement of learning.

Every time we choose a piece of technology we choose a new

perspective of the world. Technology is not a neutral zone.

An ecological approach

Neil Postman in his book *Technopoly* points out how technological change is neither additive nor subtractive. It is "ecological" in the same sense as the word is used by environmental scientists. One significant change generates total change. In the year 1500, fifty years after the printing press was invented, we did not have old Europe plus the printing press. We had a different Europe. After television, the United States was not America plus television; television gave a new coloration to every political campaign, to every home, to every school, to every church, to every industry. And that is why competition among media is so fierce. Surrounding every technology are institutions whose organization--not to mention their reason for being--reflects the world-view promoted by technology. Therefore, when an old technology is assaulted by a new one, institutions are threatened, a culture finds itself in crisis. This is a serious business, which is why we learn nothing when educators ask, "Will students learn mathematics better by computers than by textbooks?" Or when politicians ask, "How effective are messages sent through different media?" Such questions have an immediate,

practical value to those who ask them, but they are diversionary. They direct our attention away from the serious social, intellectual, and institutional crises that new media foster.

What we need to consider about the computer has nothing to do with its efficiency as a teaching tool. We need to know in what ways it is altering our conception of learning, and how, in conjunction with television, it undermines the old idea of school. Who cares how many boxes of cereal can be sold via television? We need to know if television changes our conception of reality, the relationship of the rich and the poor, the idea of happiness itself. [58]

Neil Postman is right in pointing out that the computer is a completely different way to look at reality, and from this little experience I had in comparing two media I have now a better understanding of how to use them. Since the appearance of human beings on earth we have been changing and re-constructing reality, and the computer is just one way to re-construct our world. The big problem of communication today is ermeneuthic. The understanding of the symbolic systems that constitute and underlie the different

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[58] Postman, N., Technopoly , The Surrender of Culture to Technology , Vintage, New York, 1993, pp. 18-20.

media is vital to the development of a democracy of the communicative experience.

Interactive hypermedia is a new complex approach to reality that needs to be understood in its complexity. The convergence of different forms of art expression, humanistic and scientific disciplines, calls for a new dawn of collaboration that can be also a new dawn of a better relation among human beings.

APPENDIX

RADIO DRAMA SCRIPT

Ambient sound (people talking and walking around; in the background, loudspeakers announcing the different tours in different languages)

MOM: (concerned) Bobby and Sarah, come here! I want you to stay close. In a few minutes, it will be our turn to go down in the catacombs.

BOBBY: O.K. mom! don't worry, we take just a short look around, this place is very interesting.

DAD: (Authoritative) I want you back in ten minutes!

MOM: (concerned) Philip! You should keep an eye on them

DAD: Don't worry Helen! They are two smart kids!

(Loudspeaker announcing a new Tour)

BOBBY:Sarah! Come here! (very excited) Look! (pause) It's open!

(sound of a old door that is being opening)

SARAH: Wow! (very surprised, almost breathless)

BOBBY:(with proud voice) Welcome to the third century! May I guide your majesty!

SARAH: (Reacting to the mockery) Don't be silly! It can be dangerous! We have to go back in ten minutes

BOBBY: (superman) What danger! Come on, let's go. Just a short preview, that's all.

SARAH: It's dark in here. (Echo Effect)

BOBBY: (bored) Here! Take my flashlight out of my backpack.

(sound of a opening zipper)

SARAH: (Surprise) Look there.

BOBBY: Where?

SARAH: On the wall, what's that?

BOBBY: It looks like graffiti,... like a fish!

(sound of steps going around the catacombs)

SARAH: Yea, you're right, I know what that is.

BOBBY: What?

SARAH: (Intellectual) The Christians used symbols like this to evoke a spiritual idea or reality. I heard my teacher say that the word fish in Greek is..... (trying to remember the exact word) ΙΧΘΥζ ! (Ichthys).

The interesting thing, she said, is that arranging these Greek letters vertically, you get an acrostic which means: (Reinforcing the tone)
"Jesus Christ, Son of God the Savior"

BOBBY: (Surprised) Hey, look over there. There's something else on the wall and it looks like a shepherd, look there are also sheep.

(Special sound effect like if something is appearing.)

GS: (a mysterious voice come from nowhere) You're right! I'm the good shepherd.

BOBBY & SARAH: (almost choking) Who's that?

GS: Don't be scared, I am the Good Shepherd, I' m the guide for many people that get lost in the catacombs. Do you wont to take a tour?

SARAH: Wait, we don't even see you, how can we trust you!

(special effect and he appears, the idea is that the good shepherd materializes))

GS: Can you see me now!

BOBBY: (overwhelmed) Wow! How did you do that!

GS: (Whispering) That's a secret!

SARAH: (With suspicious voice) Why are you so interested to bring us around these caves down here?

GS: You mean the catacombs?(patient and warm tone) You see, the catacombs can be regarded as the cradle of Christianity and the archives of the primitive Church. Their paintings, their sculpture, their inscriptions provide the most valuable material for illustrating the use of customs by the early Christians, they also show the history of the persecution the early Christians suffered. Come, I'll show you.

(they start to move, sound of steps moving on the ground)

BOBBY: (almost nosy) Why there are so many holes in the walls?

GS: those are not holes, those are rows of tombs called *loculi* the bodies were placed inside, wrapped simply in a sheet or shroud. The corpse might have been sprinkled with scents. After the burial the loculus was closed with tiles, bricks or thin marble-slabs, and a small oil lamp was placed beside the tomb. Look there and you will see....

(Interlude with bells, chants, and prayers in Latin the idea is to recreate the scenario of a burial)

SARAH: (Very surprised) Wow! that's cool..... (becoming almost argumentative) but tell me why did the Christians dig the catacombs?

GS: For various reasons. First of all they rejected the custom of cremation
BOBBY:(very confused) Crenation? what's that?

SARAH: Not crenation, (almost spelling it) cremation... when you burn a dead body to ashes.

GS: That' s right, but especially because Christ was buried and they wanted to follow Him in everything. A more practical reason was that a tomb in antiquity was sacred and even after years nobody could take it. The burial space would pretty soon end, so the choice of excavation solved the problem. But let's go on.

(sound of metal against the rock, like digging something on the ground))

BOBBY: (surprised and curious) Who are they?

GS: They are called *fossores* from the Latin *fodere* , to dig. Their work was lengthy, and required patience. They dug by the dim light of oil lamps and with baskets or sacks they remove the dirt

SARAH: Gee, that has to be exhausting!

GS: Come I want to introduce some friends

(sfx... meanwhile)

MOM:(with apprehension) Philip, I don't see Bobby and Sarah

DAD:(relaxed) Don't worry Helen, I'm sure they will be back in a few minutes, let's enjoy these few minutes of peace!

(sfx...meanwhile)

GS: Here we are. This is the famous Crypt of the Popes.

SARAH: How do you know that?

GS: Well , it took a while to discover it, because barbarians, pillagers, and thieves who broke in through the centuries left the crypt pretty empty. Luckily for us, those people out of ignorance, took no notice of the smallest bits of marble. Look here, what do you read?

SARAH: (Spelling the name) P-a-b-i-a-n-o (trying to pronounce it) Pabiano

GS: (almost laughing) no, no, no... the first letter is a greek Phi and you should pronounce it "FABIANO." And this here written beside it is "SCOTOS MARTUS" that means "Bishop and martyr"

FABIANO: You're right (a mysterious voice appears)

GS: Hello Fabian! Let me introduce my new friends Sarah and Bobby

FABIANO: Hello Sarah!

SARAH: Hi!

FABIANO: Hello Bobby!

BOBBY: Hi!

SARAH: Are you the only one in this Crypt?

FABIANO: Oh no, there is also, Eutichian, Pontian, Sixtus II, Lucius and Antherus. I was elected pope when Antherus died and I had to reorganize the Church that was seriously damaged by Maximinus' persecution, but unfortunately Quintus Messius Gaius Trajan Decius

BOBBY:(Confused) Who's that?

FABIANO: The name of the emperor when I was Pope. Anyway he was trying to restore the ancient Roman tradition, including religion (trumpets on the background and words in Latin)
So he set out systematically to uproot Christianity, which he judged to be politically dangerous.

(sounds of trumpets and timpani)

GS: He issued an edict which required every subject to sacrifice to the official State divinities before the local authorities. Many who refused were imprisoned, tortured and forced into idolatry. Pope Fabian was one of the first victim.

SARAH: So you were buried here!

FABIAN: Yes, but you see for us Christians this is not a place for the dead. In fact we even changed the name. The pagans use to call it NECROPOLIS which means "city of the dead".

GS: While the Christians preferred the word "cemetery", which they coined from the Greek verb *Koima'o* , to sleep. The word really reflects the Christian faith in the resurrection.(pause) The rising to a new life!

BOBBY: But, then why are these called catacombs?

FABIAN: The term "catacombs' was not used by the early Christians, but appeared later in the Middle Ages.The Romans applied the term *Catacumbas* to a place on the Appia Way.

GS: And the word means "near the hallow" , in fact in that area before reaching the tomb of Cecilia Metella there is a depression in the ground. Over time, the term "catacombs" came to indicate all the cemeteries of the first Christian Church.

(sfx.... meanwhile, on the surface)

MOM: Philip, have you found 'em.... (with apprehension)

DAD: No, Helen, but I'm sure they're around here somewhere!

MOM: Philip this is not East Lansing, this is Rome... (almost screaming) Let's go to the information desk and ask 'em to call BObby and Sarah through the speakers

DAD: Can't we wait few more minutes?

MOM: No, Philip, let's go
(sfx... meanwhile down in the catacombs)

GS: And here we go, this is the Cubicula of the Sacraments

BOBBY: What's a "Cu...cu...cubi...cubicola"

SARAH: I know that, cubicula means small rooms.

GS: Very good! I love this in particular. As you can see at the center of that wall, there is the painting of the multiplication of bread and fish. Do you know what it symbolizes?
BOBBY: I know this. It's the miracle that Jesus did.

GS: That's right, but more precisely?

SARAH: The Eucharist

GS: You got it! and the interesting thing is that this scene is repeated always in the same way: seven persons sit around a table. The number seven is symbolic and indicates that all are called by God to be saved. And even the fish and the bread are always in a symbolic number of seven or twelve.

(from the outside with a muffled sound)

SPEAKER: Bobby and Sarah, please come at the information desk (repeated)

GS: I believe somebody is looking for you

BOBBY & SARAH: (anxiously) Mom and dad... How can we get out of here?

GS: Relax! ...and look (special sound effect, and they are at the entrance) here we go!

SARAH: (overwhelmed) Awesome!

GS: Well...time's up! Now hurry, take the stairs and go up....

BOBBY: Hey, Mr. Good Shepherd where are you...

GS: I'm still here!

SARAH: But we can't see you! Don't go away

GS: You know were you can find me, do not tell anybody else. See you soon. I still have many things to show you.

(coming out of the door and walking back to their parents)

SARAH: Wow! that was incredible!

BOBBY: Yes, we have to figure out the way to come back!

MOM: (with apprehension) Bobby... Sarah... where have you been! Your father and I have been looking for you 20 minutes

SARAH: Sorry! But we have found some friends and we started to talk.

DAD: (very logical) Don't you have a watch?

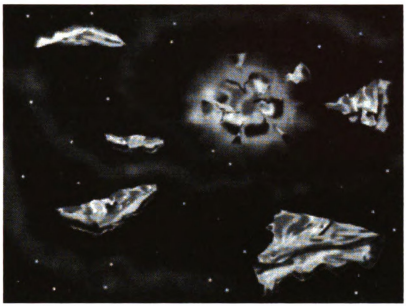
MOM: Let's go that our tour is going down.

(speaker announces the beginning of the tour, and the guide starts talking)

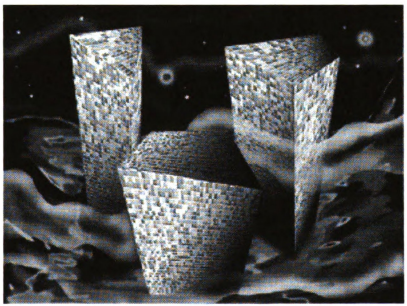
SARAH: This is gonna be so boring!

BOBBY: No kidding!

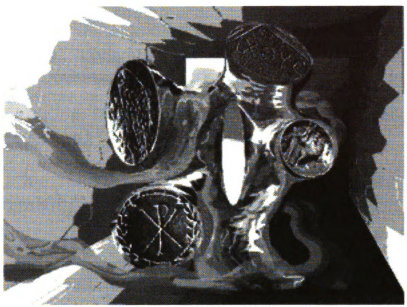
(Music)



Picture n.1 Universe One



Picture n.2 A Planet



Picture n.3 A Room

Picture n.4 The Question

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