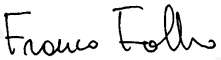
UNIVERSITÀ DEGLI STUDI DI UDINE
DIPARTIMENTO DI SCIENZE UMANE
CORSO DI DOTTORATO DI RICERCA IN COMUNICAZIONE MULTIMEDIALE
CICLO XXIV

TESI DI DOTTORATO DI RICERCA

Audio-Visual Scientific Popularisation
Theoretical Analysis and Critical Realisation

DOTTORANDO:
Dott. **Marco D'Agostini**

RELATORE:
Prof. **Franco Fabbro**



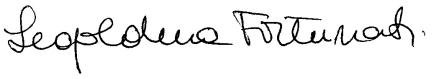
ANNO ACCADEMICO
2011/2012

1. Reviewer: Professor Raffaella Rumiati

2. Reviewer: Professor Salvatore Aglioti

Day of the defense: April 23th, 2012

Head of PhD committee: Professor **Leopoldina Fortunati**



Abstract

The purpose of this work is to give a theoretical account for different forms of audio-visual popularisation and to present the elaboration of several videos created on the basis of a scientific textbook.
The analysis of the concept of popularisation from an historical, sociological and epistemological perspective, is introductive to a chronological and stylistic review of the main audio-visual media (cinema, TV, internet) that in different times have used new codes in order to communicate and spread scientific knowledge.
The integrated use of the verbal language and the visual one boosted the possibility for authors and technicians to make simultaneously use of audio device, video and graphic animation to convey scientific contents to a large audience. This kind of communication inevitably implies a translating process and a certain degree of simplification.
After framing the historical and social context where in different forms audio-visual products came to hold a key role in the popularisation process, the second part of my work focuses on the stages planned in order to elaborate a scientific audio-visual. I especially refer to the process related to the phases of pre – production (script), production and post – production, leading then the attention on a peculiar pattern: the creation of videos starting from a scientific textbook.
In the attempt to shed light on both the process of *transumation* (the passage from a certain semiotic system to another) and the one of *adaptation* (from cinematographic language, a process allowing the transposition from a text to the screenplay), the creation of several videos based on the book: *Neuropsicologia dell'esperienza religiosa* (Franco Fabbro, Astrolabio, Roma 2010) has offered new ground for the analysis of the language, of the codes and of the styles to be possibly used in this kind of operation. Not the least this experimental and practical phase

allowed to detect and to valuate the ways (advantages and disadvantages) at disposal to vehicle the audio-visual.
Through the practical work and the methodological analysis it has been possible to trace an assessment about the tools each audio-visual scientific informer disposes. The transmutation of a scientific text enabled to identify opportunities and impediments that represent the constraint for a popularisation of this kind.

“What else can we do now
Except roll down the window
And let the wind blow back your hair
Well the night's busting open
These two lanes will take us anywhere
We got one last chance to make it real
To trade in these wings on some wheels
Climb in back
Heaven's waiting on down the tracks
Come take my hand
Riding out tonight to case the promised land.”
(B.S.)

Ringraziamenti

Desidero innanzi tutto ringraziare il professor Franco Fabbro per i preziosi insegnamenti durante i tre anni.
Ringrazio la professoressa Leopoldina Fortunati per la sua disponibilità e presenza.
Ringrazio la Professoressa Raffaella Rumiati e il Professor Salvatore Aglioti.
Ringrazio Thomas per le stampe e i preziosi silenzi.
Ringrazio Lavinia per l'aiuto fondamentale nella traduzione.
Infine, ringrazio i miei genitori e mio fratello che non hanno mai fatto mancare il loro sostegno.

Indice

Abstract iii

Ringraziamenti vi

Introduction xii

1. Scientific Popularisation: History, Models and Interpreters 1

1.1 Introduction ... 1

1.2 The Historical Evolution of Popularisation ... 4

1.2.1 The Origin of Popularisation ... 4

1.2.2 The 16th and 17th Century ... 6

1.2.3 The 18th Century ... 9

1.2.4 The 19th Century ... 11

1.2.5 Popularisation in the 19th Century in Italy ... 14

1.2.6 The 20th Century ... 19

1.3 The Scientific Communication Today ... 21

1.3.1 Sender and Recipient in Scientific Popularisation ... 22

1.3.2 The Classical Model ... 25

1.3.3 The Scientific Populariser ... 26

1.3.4 The Translation ... 28

1.3.5 The Model of Continuity ... 29

1.3.6 The Audio-Visual Popularisation ... 33

2. The Scientific Cinema and the Documentary 37

2.1 Introduction ... 37

2.2 The Origin of the Cinema of Science ... 41

2.2.1 Pierre – Jules – César Janssen ... 42

2.2.2 Eadweard James Muybridge 44
2.2.3 Etienne – Jules Marey 48
2.2.4 Felix Louis Regnault 52
2.2.5 Other Contributions 53
2.2.6 The Kineto-Phonograph by Edison 57
2.3 The Advent of Cinema 60
2.3.1 The Production of Lumière 62
2.3.2 Georges Méliès 65
2.4 The Evolution of Scientific Cinema 67
2.4.1 The Bird of Visual Anthropology 68
2.4.2 The Surgery Cinematography 70
2.4.3 The Rontgenfilm 72
2.4.4 The Micro-Cinematography 73
2.4.5 Between Cinema of Science and Documentary 74
2.5 The Documentary Cinema and its Forms 77
2.5.1 Contemporary or Historical Reconstruction Documentaries 78
2.5.2 Documentation of Events without Intervention on the Filmed Reality 82
2.5.3 Survey and Reportage Documentary 84
2.5.4 Interview Documentary 89
2.5.5 Archived-Based Film 91
2.5.6 The Film-Essay: Metalinguistic Films and 'Short-Circuit' Films 94
2.5.7 Experimental and Advanced-Guard Film 97
2.5.8 From the Documentary to the New Forms of Communication 100

3. From Pedagogic TV to Web-Video 103

3.1 Introduction 103
3.2 History Italian TV 107
3.2.1 The Beginning of the Broadcasts 107
3.2.2 The Sixties 112
3.2.3 The Seventies 116
3.2.4 The Eighties 118
3.2.5 The Private TV 123

3.2.6 The Nineties and the New Millenium 125
3.3 The Different Forms of Scientific Popularisation on TV 128
3.3.1 The Shooting Model 128
3.3.2 The Tension Model 131
3.3.3 The Indirect Model 132
3.3.4 Excluded Cases 133
3.4 The Digital Television 135
3.4.1 The Digital Televisions 136
3.4.2 Television on the Web 140
3.4.3 The Autonomous Forms of the Internet: Feed Reader Contents and Blogs 141
3.4.4 Characteristics of UCG and Future Perspectives 148
3.4.5 The Telematic Universities and the Video-DVDs 150

4. Analyses of Popularising Audio-Visual 155
4.1 Introduction 155
4.2 The Film: *Mon Oncle d'Amerique* 157
4.2.1 Analysis of the Film 158
4.2.2 Analysis of the 11th sequence: the Rats in the Cage 159
4.2.3 The Direction 159
4.2.4 Degree of Pupolarisation 160
4.3 The Documentary: *From the Depth of the Soul* 161
4.3.1 Analysis of Documentary 161
4.3.2 Analysis of the First Two Sequences 163
4.3.3 The Direction 163
4.3.4 Degree of Popularisation 164
4.4 The TV Programme: *Il Corpo Umano, il Cuore* 165
4.4.1 Analysis of the Programme 166
4.4.2 Sequence Analysis 168
4.4.3 Degree of Popularisation 168
4.5 Web Video: *The Origin of Pleasure* 169
4.5.1 Analysis of the Lecture 169
4.5.2 The Direction 169
4.5.3 Degree of Popularisation 170

4.6 Video on Digital Support (DVD): *The Pre-Socratics and the Birth of Philosophy* 171
4.6.1 Analysis of the Lecture 172
4.6.2 Analysis of the sequences 172
4.6.3 Degree of Popularisation 174
4.7 Comparison 175

5. Technique and Case of Study 179
5.1 Introduction 179
5.2 The Pre-Production 182
5.2.1 Screenplay 182
5.2.2 Ideation and Organisation 183
5.2.3 The Adaptation 184
5.3 The Production 187
5.4 The Post-Production 189
5.5 Characteristics of the Model 191

6. Conclusions 193
6.1 Conclusions 193

Appendix - A 197
A.1 Introduction 197
A.2 The Film: *Mon Oncle d'Amerique* 198
A.2.1 Analysis of the Geneal Structure of the Film 198
A.2.2 Analysis of the Sequence Number 11 of the Film. 200
A.3 The Documentary: *From the Depth of the Soul* 204
A.3.1 Analysis of the General Structure of the Documentary 204
A.3.2 Analysis of the First Two Sequences of the Documentary 205
A.4 The TV Programme: *Il Corpo Umano, il Cuore* 209
A.4.1 Analysis of the Geneal Structure of the TV Programme 209
A.4.2 Analysis of the Sequence n. 3: The Circulatory Sistem 210
A.5 Web Video: *The Origin of Pleasure* 213
A.5.1 Analysis of the General Structure 213
A.6 DVD: The Pre-Socratics and the Birth of Philosopy 215

A.6.1 Analysis of the General Structure 215
A.6.2 Analysis of the Sequence: Frontal Lecture 217
A.6.3 Analysis of the Sequence: External Contribute 218

Bibliography **221**

Webliography **226**

Introduction

The strict relation between scientific research and new technologies of communications surely represents one of the most characteristic features of our time. Driving force of development and competition, crucial element for the military and economical supremacy, but also source of the greatest dilemmas of our time, science is not only produced inside the research centres, the laboratories or the industries, it is not only discussed in university classrooms or in the Parliament. The traditional image of the magician-scientist locked into his 'ivory tower' has given way to a new figure able to carry out researches that satisfy the traditional disciplinary criteria of quality and that are significant for some users.[1] For this reason, the scientist today needs more and more to establish a direct, fast and secure contact between what happens in the laboratories and public opinion. Bio-technologic enterprises or academic scientists that are not able to explain – and negotiate – what they do and why, run the risk of seeing their experimental maize fields set on fire.[2]

The communication between specialists and non-specialists is 'mediated', it is namely filtered by communication tools such as press, television, radio and the Internet. These channels have to be regarded in terms of a specific space provided with its own autonomy, to be fully integrated into that process of knowledge transmission by now indispensable for any scientist and researcher. That being so, the scientific populariser's – work both journalists and scientists engaged in communication - has been progressively defined with the passing of years. Studies on communication and experimentations with the new technologies of transmission, allowed to specify the competences of a professional figure that has to be able to "translate situations" and complex, specialist languages into communicative forms accessible to the major part of the desired audience, avoiding trivializations. Once this activity was mainly carried out in the journalistic field, while today it appears under various forms including the communication through

[2] Castelfranchi-Pitrelli, 2007

documentaries, television programmes, the Web, or directly side by side the scientists in press agencies or in companies involved in technological innovation.

Through a detailed analysis of the various forms of scientific video currently available, the aim of this work is to provide researchers and scientists with a useful tool for transmitting their knowledge in a plain and direct way.
I start from an historical review on the origin and the developments of scientific popularisation, in order to highlight the evolution of this process and to frame this phenomenon within the current panorama. The analysis of the communicative models and their interpreters has revealed to be necessary in order to establish the reference area within which the protagonists of this communicative practice operate. This study has shed light on some key elements of audio-visual popularisation that in order to be efficacious need to fit rules and canons that prevent from misrepresentations.

Next I focus the analysis on different audio-visual forms that are currently at disposal of any populariser. From the origin of scientific cinema, developed starting from the second half of the 19th century, passing through the documentary and the television programmes, the study leads to the forms of videos that can be found on the Web. A rich and multiform path after which I compare the different audio-visual typologies (film, documentary, TV programmes, Web-videos and video-DVDs), in order to underline their potentialities and limits of each form.

The case-study represents the core of my work, since it allowed me to verify and put into practice the theoretical concepts I have preciously explored, by proposing an original model of scientific communication through the audio-visual. Especially referring to the semiotic principle of transmutation and the cinematographic one of adaptation, I have realised the transposition of a scientific book into a series of divulging videos (the videos can be found on-line: http://www.marcodagostini.com). This operation allowed me to verify "on the field", during the different stages of production (ideation, organisation, shooting and editing), the proper instruments for an efficacious calibration of scientific contents and the expressive potentialities of the video.

Scientific accuracy and clear expression, but also capacity to use the audio-visual language constantly reinventing the way of telling and communicating: this is the challenge that the populariser of the third millennium has to win in order to be able to vehicle the scientific message with success and competence, in the light of the multiple channels and systems today available.

In so far as the scientific facts can be certain and the ideas we have elaborated about those facts may be right, we can only transmit other people false impression if we lack the words by ideas.[3]

1

Scientific Popularisation: History, Models and Interpreters

1.1 Introduction

The popularisation[4] represents one of the ways to convey science, allowing knowledge to go beyond the borders of a limited community of specialists. This

[3] Antoine Lavoisier 1743 -1794.

[4] The use in the Italian language of "divulgazione" and "divulgatore" should go back to the XVI century (cf. Grande dizionario italiano dell'uso, T. De Mauro, UTET, Torino 1999, vol. 2 p. 711). The English use of "popularisation" should go back to the years between 1797 and 1801 (cf. The Oxford English Dictionary, 2 ed. Oxford Clarendon Press 1989, p. 126). The appearance of the French verb "populariser" seems to go back 1789 (cf. Trésor de la langue française. Gallimard, Paral 1988, vol. 13, pp. 778-9). The Italian expression "divulgazione scientifica" does not find today a single English correspondent, both conceptual and lexical, giving then room for a series of different denominations:

- Divulging as simplification (popularisation). It is the translation of scientific concepts into accessible terms to be conveyed to a larger range of population. The language that is used is simple (at times even entertaining) and clear. Mathematical symbols and technical vocabularies are avoided.
- Divulging as diffusing (spread of scientific news). Authors of specialised magazines and newspapers too transmit the scientific news to the public. That can occur both within and outside the scientific community. Articles, press releases features, blogs, are some of the possible formulas.

operation, which implies the passage from one field of knowledge to a different one, is imbued with linguistic, cognitive, sociological and epistemological implications. The scientific divulging aims to diffuse to a mass level the intellectual tools that consent to understand problems, needs and connections within an advanced and complex society. It is then characterised not solely by an informative task, but by a strictly formative one, in order to transmit ideas, methods and ways of thinking that can improve the quality of life of everybody and make us aware about the era we are experiencing.

> «The importance of scientific communication at all social levels springs from the fact that science has not only enabled technological development, but it has also changed, over the centuries, our vision of the world, giving some partial explanations to the questions that since ever the philosophers have raised: what is the universe, how life begun, when man has first appeared, what will be the destiny of the earth. Today we know immensely much more than one hundred years ago. The question is to adapt our culture to the time we are experiencing in order to be human beings of our time and not distant predecessors of ourselves.» [5]

During each historical stage, science has been bound to different forms of diffusion, recording and discussion of information. It can be certainly said that there is no science where there is no communication.[6] Since ancient times, one of the elements that led people to approach scientific knowledge has been the foreseen possibility that researches, innovations and findings could better everybody's life. As well as a curious public opinion interested in scientific revelations, there has also been an increasing attention by the researchers to communicate the results of their work. Today scientists consider the strategies to communicate their findings - to experts as much as to non-experts- as a crucial part of the process of knowledge production.[7]

- Divulging as constant education (scientific education). The research becomes constant education, developing this way reflexive capacities.
- Divulging as entertainment (Scientific entertainment). The scientific news is translated and transmitted by using specific modalities and tools from entertainment. The fascinating features are enhanced while data and elaborations that may result too heavy are excluded. Communication is direct, immediate and spectacular, with the aim to touch the sensitivity of the public through curiosities and surprises. (Grasso, 1988, p.183)

5 Angela, 1998, p. 107.

6 Castelfranchi, Pitrelli, p. 27.

7 Govoni, 2002, p. 40.

The process to achieve this state of vital exchange has begun during the core of Middle Ages with the invention of the printing system with reusable and durable type by Gutenberg. Since then, also thanks to the multiplication of the transmission channels available, the spread of knowledge has seen a vigorous acceleration, assuring itself an increasingly significant social role.
Starting from the 17th century and up to the first years of the 19th century, in England, France, United States and Italy, the diffusion of the print has consented a remarkable growth in the circulation of knowledge. Although in a first moment almanacs and books used to blend science and superstition, over time the publications of scientists and researchers have become rigorous, coming to represent sources of knowledge increasingly accessible also outside the academic elites.
Since the 20th, on the wake of the technological revolution of the previous century, scientific popularisation has used new tools and communication channels. Over the years, the technological improvement and the multiplication of services has favoured a specialisation in the communication of science. Cinema, TV and the Internet have renewed themselves and have integrated with one another, giving life to the current hybridisation of the audio-visual language.

In this chapter, after an historical account on the origin and the developments of popularisation, useful to highlight the evolution of this practice and to frame the phenomenon according to its actuality, I will propose an analysis of the interpreters and communicative models emerging from this peculiar type of communication. I will finally draw the attention on the audio-visual popularisation. I will here introduce some key elements that will reveal to be fundamental to understand and develop the next chapters.
In order to be clear and precise, audio-visual popularisation has to respond to rules and canons that cannot give rise to misunderstandings. In this type of transmission where scientists, researchers and scholars on one hand, public opinion on the other, need to establish a relation of mutual trust and proactive collaboration in order to reach an efficacious communication of science, generating new inputs for future researches.

1.2 The Historical Evolution of Popularisation

1.2.1 The Origin of Popularisation

The origin of popularisation in the modern era goes back to the second mid of 15th century, when the invention of the print by Gutenberg[8] in a short time manages to bring down costs and times of books reproduction, incredibly increasing their number and circulation.[9] The exponential growth of available texts allows to regain the process of diffusion of the written word that met a long decline during the previous centuries. If in ancient Greece the practice of reading was widely spread, afterwards the book has been cloistered into monasteries and churches, where it remained confined exactly until the revolutionary invention of Gutenberg. The invention of the print offers philosophers, men of letters, physicians, astronomers and mathematicians, as yet religious people, the opportunity to realise an old dream: to communicate in a cheap way with a larger number of readers, not necessarily educated or experts of some specific field of knowledge.[10]

> «The civilizations develop through the writing and the passage from oral communication to the written word is what mark the development of a civilisation. But up to the invention of print the culture of each continues to be mainly founded on oral transmission. […] The homo sapiens who multiples his knowledge is then the Gutenberg man. It is true that the bible printed by Gutenberg between 1452 and 1455 had a press run (which is risible to us today) of

[8] Johann Gutenberg (Mainz, 1394-1399 – Mainz 1468), was a German inventor and goldsmith. His main contribution to history comes from his invention of the print. The printing procedure consisted in aligning the single characters in order to form one page, which was sprinkled with ink and pressed on a sheet or parchment paper. The possibility to reuse the characters was a real invention since hitherto the printing matrices were obtained from a unique piece of wood (xylography), which could be used only to print the same page. The alloy for the characters of Gutenberg was formed by lead, antimony and tin, cooled down quickly and could resist the pressure of the print. The machine used for printing was a re adaptation of the screw presses used in the production of wine, consenting to evenly distribute the ink on the page. (Cf. Lodovica Braida, Stampa e cultura in Europa – Laterza, 2000)

[9] It has been calculated that in 1450 in Europe there were 200.000- 300.000 printed texts. About fifty years after the invention of Gutenberg were circulating 10-20 millions of books (cf. Un pubblico per la scienza, Govoni, p. 44).

[10] Govoni, 2002.

> 200 copies. But those 200 copies were re-printable. The technological gap had occurred. It is therefore with Gutenberg that the written transmission becomes accessible to everybody.» [11]

During the 16th century and up to the first years of the 17th century, the communication of science through books, texts and journals is a disorganised flow without filters. The printing revolution generates the undifferentiated production of texts scientifically relevant and indispensable, together with booklets and publications with doubtful if not even scarce scientific value. That is a process where 'high' and 'low' culture are mixed together, and where the indiscriminate desire of people to know demote the credibility and reliability of the books in circulation. A clear example in this sense refers to the spread of almanacs. The almanac, as complement of scientific data, contains divination elements and astrological indications that have nothing to do with scientific news. A magma of information without discernment, between science and popular believes, where a useful medical suggestion is mixed with superstitions, horoscopes or cooking recipes.

> «This little publication, cheap and distributed by stallholders, has been the only one for several centuries, or at least the main written source available to millions of people in Europe; the only printed text able to compete, in quantity too, with the book of prayers. (…) It is evident that it was an important phenomenon, which has contributed to a remarkable extent to the spread of scientific knowledge, as well as, obviously, to the rooting of superstitions and false believes to which the Enlightenment followers will declaim war by making use of the almanac itself.» [12]

An important aspect of the explosion of knowledge through books is the opportunity the print offers not only to divulge science but also to actively make it. The communication among scientists through texts and essays allow an acceleration of knowledge and offers a propulsive boost to new researches. Within the astronomical, medical and natural sciences field, the diffusion of almanacs and manuals favours the awareness on the state of art, from which scientists can start their new studies.

[11] Sartori, 2007, p. 7.

[12] Govoni, 2002, p. 46.

> «For Copernicus himself, at a certain point of his life, the availability of printed works was determinant: locked into his observatory tower, Copernicus was no longer in direct contact with the world as he used to be during his itinerant youth, but he finally had at disposal, unthinkable just few years earlier, recent astronomical data and calculations, as well as the old ones, in new printed editions. All that offered a new extraordinary tool for his work.» [13]

1.2.2 The 16th and 17th Century

The process of scientific channelling into a single flow with no discernment progressively softens starting from the second mid of 16th century. The routes of communication connecting who produce knowledge and who receive it, diversify and multiply, assuring a better analysis about the credibility of printed information. A representative example with this regard is Galileo Galilei[14]. In order to

[13] Govoni, 2002, p. 45.

[14] Father of the modern science, Galileo Galilei is the thinker we own a new way of making science, based on a solid method that does no longer rely solely on the direct observation of nature, but also on the use of scientific tools. He was born in Pisa on 15th February 1564, he studies literature and logic in Florence. In 1581 he enters the faculty of Medicine at the University of Pisa, but he will not develop a real interest in this subject. He returns to Florence were he becomes keen on mechanic and begins to build increasingly sophisticated machines, deepening mathematical studies and carrying out researches in physics. In 1589 he obtains the chair in mathematics at the university of Pisa, which he will maintain until 1592; in that period he is interested in the movements bodies in fall and writes "De Motu". In 1593 the university of Padua offers Galileo a prestigious chair in mathematics, geometry and astronomy. Galileo enthusiastically accepts and remains there until 1610. In that period he orientates towards the Copernican theory on the planetary motion, corroborated by the observations he carries out with a new instrument designed in Holland: the telescope. Galileo will significantly improve it. In 1609 he publishes his "Nuova astronomia", which contains the first two laws of the planetary motion. In Padua Galileo with his new instrument carries out a series of observations of the moon in December 1609; on 7th January 1610 he observes some luminous "small stars" near Jupiter. On March 1610 he reveals on "Sidereus Nuncius" that they are four satellites of Jupiter that he will baptise "Astri Medicei" in honour of Cosimo II de' Medici, Great Duke of Tuscany. Only later on, under suggestion of Kepler, the satellites will be defined by the names we know today: Europa, Io, Ganimede and Callisto. The discovery of a centre of motion that was not the Earth begins to undermine the Ptolemaic theory of the cosmos. The astronomical theories of Galileo are soon considered incompatible with the truths revealed in the Bible and in the Aristotelian tradition. As first consequence cardinal Bellarmino formally admonishes Galileo. After all Galileo simply confirm the Copernican theory, which was far back known. The ecclesiastic Inquisition does not see reason and labels this cosmological theory as heretical and formally forbids Galileo to support those theories. On April 1630 Galileo completes his work, where he compares the Copernican and Ptolemaic theories, obviously demonstrating the

communicate discoveries and scientific insights this scientist does not limit himself by making use of diverse literary genres, according to the specific contents, aims and the kind of public he meant to address. Galilei exploits every literary channel available by promulgating his ideas through treatises, letters and dialogues. Especially with the *Dialogue*, the Tuscan scientist aims to reach a non-specialist public. By this kind of writing he recalls the oral tradition and the theatrical plays, in a pedagogic attempt to involve the interlocutor into a learning process that radically differed from the approach characterising the treatise. That is then a downright divulging intention, aimed at reaching even the less prepared ranges of population.[15]

With the Galilean and then Newtonian science, the contribution to literature assumes the form of a rational prose of scientific communication, extremely different from the one characterising the Aristotelian encyclopaedic matrix and its magical-naturalistic versions. It contrasts the playful attitude to acumen and the virtuosity of analogical erudition, in the name of a plain and simple writing that wants to address the craftsman too. The new scientific academies, from Rome to London and Paris, confirm that costume of argumentative clearness. In spite of that, in his work *Il Saggiatore*, which is basically an address on method before Descartes, Galilei demonstrates that it is also possible to give space to a rhetoric of the true, an ironical and inquiring perspicacity, able to combine the accuracy in demonstrations and experiments with the gentle and various manners of a passionate conversation. The scientific debate shapes new communicative genres

---

superiority of the new scientific acquisitions. He also arranges with Vatican some adjustments to be able to print his work, but he then decides to print it in Florence, in 1632. Reached the hands of Pope Urbano, he bans its distribution and addresses the Inquisition to institute a prosecution against Galileo. The scientist, old and ill, is called to Rome and processed (1633). Imprisoned and threatened with torture, Galileo is forced to publicly abjure and condemned to prison for life. It is said that on that occasion Galileo muttered between his teeth "*Eppur si muove*". He is granted to serve his punishment in his manor at Arcentri, near Florence, exile prison until his death. He died in Florence on 8th January 1642, surrounded by a few pupils and almost completely blind. To Galileo is due the law of pendulum (at any extent the time of oscillation is constantly the same): inside the cathedral of Pisa it can be still admired, hanging from the very high temple vault, the lamp whose oscillations inspired the young Galileo the invention of the pendulum as regulator of a mechanic movement.

[15] See Govoni p. 47; see Altieri Biagi, *Scrittori di scienza e generi letterari*.

such as the letter, the report, the news, the memoirs; it invites to elegance and naturalness and refuses the emphasis of an old academic rite.

The new communicative literary models represent the response to a cultural and scientific phenomenon that in the course of the 16th century and even more during the 17th century, grows wider and stronger. In 1602 Tommaso Campanella[16] describes with the following words the vertiginous acceleration of times and knowledge that the Renaissance civilisation perceives:

> «V'è più historia in cent'anni che non ebbe il mondo in quattromila; e più libri si fecero in questi cento che in cinquemila; e l'invenzioni stupende della calamita e stampe ed archibugi, gran segni dell'unione del mondo.»[17]

The Renaissance is the age in which emerges the scientific knowledge and *Novum* becomes the key word in dozens of books. There are the first *Wunderkammern*, the embryos of the scientific and natural history museum, where are exposed the new worlds that have been discovered.[18]
In this period science becomes a research method and distinguishes itself from the previous forms of organisation and production of knowledge, also because it assigns a central value to experimentation and to the free and integral access to the information produced by the colleagues.[19] In this title is shaped the idea that grounds modernity and the image of progress depicting the men of science who on the shoulders of the giants of the past are able to see even further. Fathers and sons live in different worlds and modernity is characterised by the oscillation between the euphoria for the new and the fear of the movement towards the unknown.

Between the 17th and 18th century scholars from different European countries kept in touch with one another through epistolary exchange and found Academies where they could gather. In Italy are founded the *Accademia dei Lincei* (1600) and the *Accademia del Cimento* (1657). In 1660 in England is instituted the *Royal Society*,

[16] Tommaso Campanella, (Stilo, 1568 – Paris, 1639), was an Italian philosopher.
[17] Campanella, 2003.
[18] Rossi, 1997.
[19] Castelfranchi, Pitrelli, 2007.

destined to play a main role in the scientific debate and its spread. In 1666 in France is founded the *Académie Royale des Sciences.* The establishment of these Academies is followed by a series of instructions about the modalities of diffusion of scientific news. The first "manifesto" of *Royal Society* in 1667 requires its members to talk in a precise way: 'Discreet, bare, natural, clear meanings, preference for the language of craftsmen and merchants instead of the one used by philosophers'.

If the universality of science is the result of a long transitional process, mainly thanks to the invention and diffusion of print, that process reaches its definite and nearly ultimate form with the creation of the first scientific journal by the *Royal Society* of London. In this occasion are defined the practices of scientific certifications and the concepts of copyright and author as a subject with specific rights.
The new publications deeply effect and bring remarkable changes to the editorial market and to the forms of scientific communication. The journals deal with practical and legal questions that are not contained in books: they require open and unlimited licences and need a great quantity of contents. Also for this reason they invite to confront with foreign scholars.[20]

1.2.3 The 18th Century

In the course of the 18th century science and its communication continue to represent themes treated with curiosity and interest both by aristocrats and the middle-class. Highly pedagogic time, the Enlightenment renders the communication a banner and it is no accident that the emblematic work within this process is one of the first great popularising text: the *Encyclopédie*, published in 1751 by Denis Diderot and Jean Baptiste Le Rond d'Alembert. It is one of the many examples of divulging texts that flourish in the 18th century, among which we

[20] Di Donato, 2009, p.16.

recall also *Histoire Naturelle, Générale et Particulière* by Louis Leclerc (1707 – 1788), *Letres Philosophiques,* work by Voltaire dealing with the collision between Newtonian and Cartesian physics and *Newtonianismo per le dame* by Francesco Algarotti (1712-1764).
If in the 16th and 17th century there had been irregular publications on news, it is in the 18th century that makes its appearance the newspaper: for the rising industrial capitalism the rapid transmission of news is a crucial element. Right from the beginning the newspapers deal with science too. Some publishers re-print articles from scientific journals or commission divulging articles. In the same period are also published the first reports in the medical, scientific and technological area.[21]

A first attempt to make the scientific knowledge more popular occurs in the United States while American culture tries to definitely detach from the English one. In the 17th century, in the mid-colonial age, the urge to break with English scientific societies and to spread the technological applications to a larger public, finds a proper means in the popular *Almanacs.* These publications presented useful indications for agriculture and notions of meteorology, as well as brief explanations on the ideas of Newton and the Copernican theory.[22] In the course of the 18th century the almanacs gain even more credibility. In 1773 the *Poor Richard Almanack*[23], published by Benjamin Franklin, unifies the accounts of experiments with teachings imbued with a lay moral. Applied research, exaltation of technology and popularisation are source of social consensus and animate the spread of the Almanac by Franklin.

[21] Castelfranchi, Pitrelli, 2007, p. 34.

[22] Grasso, 1988, p. 193.

[23] *Poor Richard's Almanack* (sometimes *Almanac*) was a yearly almanac published by Benjamin Franklin, who adopted the pseudonym of "Poor Richard" or "Richard Saunders" for this purpose. The publication appeared without interruption from 1732 to 1758. It was a best seller for a pamphlet published in the American colonies; print runs reached 10,000 per year. The *Almanack* contained the calendar, weather, poems, sayings and astronomical and astrological information that a typical almanac of the period would contain. Franklin also included the occasional mathematical exercises and the *Almanack* from 1750 features an early example of demographics. It is chiefly remembered, however, for being a repository of Franklin's aphorisms and proverbs, many of which live on in American English. These maxims typically counsel thrift and courtesy, with a dash of cynicism.

On the wake of the work of Franklin from 1769 to 1792 are published the first American scientific magazines[24], aiming to release useful knowledge and to enhance the sublime and divine order of nature. Although they survive only few years, these magazines deeply affect the rising American publishing industry.
In the 19th century the foundation *Lyceum Movement*[25] finds its expression in the cycles of conferences and public letters held by researchers and scientists. Its task is to diffuse the interest in natural science by managing more than three hundred lyceum and organising public readings on chemistry, biology and astronomy. The *Lyceum Movement* encourages the creation of new scientific journals[26] where collaborate religious institutions and scientific propagandists.

> «At the end of the 19th century knowledge is seen as a universal right. Capitalism transforms information into commodity and its diffusion into business. In the same years science heads for a radical transition entering the era of academy: the professional figure of the scientist takes over from the one of the natural philosopher and man of science.» [27]

1.2.4 The 19th Century

During the 19th century science grounds itself. It is then in this period that the scientis's role emerges in terms of social protagonist and professional figure.

> «The nineteenth-century scientist is not a hieratic figure, producer of an incomprehensible knowledge outside the academy and the most exclusive circles. The scientist in the age of Enlightenment, evolutionism, railways and electric light, wants that a wider public acknowledge that the economical, social and health achievements of that time are to a great extent the concrete effect of his work.» [28]

---

[24] The American Magazine, the Pennsylvanian Magazine, the Universal Asylum and Columbian Magazine, the Massachusetts Magazine, the American Museum.

[25] Founded in 1828 by Josiah Holbrook to spread the natural sciences.

[26] American Journal of science (1818), Scientific American (1845), Popular Science Monthly (1872).

[27] Castelfranchi, Pitrelli, 2007, p. 36.

[28] Govoni, 2002, p. 37.

1.

In the course of the 19th century in Europe the production of books with scientific contents is massive. Thanks to a distribution web that is increasingly capillary, encyclopaedias, almanacs and a range of different kinds of works, enhance the spread of knowledge. At that time, for reasons linked to the book market, there is the need to produce texts that deal with monographic themes. In order to reach a large public willing to get specialised, it starts out the production of books on specific topics with restrained costs and dimensions. The new technologies applied to the print and the reinforcement of the railway contribute to facilitate this specialisation and a rapid capillary diffusion.

In that time, in the main European countries emerges the figure of the scientific communicator. Within an increasingly dense network of exchange between science and public, the populariser, embodied by a journalist, scientist, director of museum or technician, becomes the essential mediator for the transmission of science to lower and upper middle class and in some cases, such as in the industrial cities, to craftsmen and the working class too.

In France the popularisation is hinged on the spectacular effect that nature and science can offer. In an attempt to exalt the amazing effects of these two worlds, the readers are emotionally involved in the reading of the books. In the nineteenth-century French magazines science and scientific discoveries are displayed through downright scientific spectacles.
The extraordinary originality and abundance of French scientific iconography, which has no equal in Europe with regard to books and periodicals, is the symptom of a taste and sensitivity refined by the evocative pleasure of emotions and images. Within this predilection for the spectacular, the scientific literature for women, especially in France, finds a fertile ground, wining the attention of authors and publishers.[29]

Unlike France, popularisation in England focuses on the concept of usefulness. The sake for science originates from the possibility open to anybody to experiment the

[29] Govoni 2002, p.55.

recent discoveries. Children, women, botanists, by reading magazines and divulging manuals, can nourish in their houses and gardens their love for science and nature.

In the United States the nineteenth-century popularising journals mainly deal with the idea of the construction of a new ideal society where man is finally able to manage by his own faculties the individual and collective well-being. In USA, the same way as in England, emerges a scientific nationalism that is linked to the myth of technological avant-guard and to the new exploratory and conquering spirit: in 1886 is founded the *National Geographic Society*, main support to many scientific expeditions that significantly resounds by public opinion through its cultural initiatives. [30]

Another important element concurring to the diffusion of a scientific sensitivity, is the *Conservation Movement,*[31] meant to convey, also by means of the new photographic technique and of its printed reproduction, the uniqueness of those vast territories destined to become the Great American Parks. This initial integration between written word and images will become an essential feature of scientific communication starting from the second half of the 19th century. As we will see throughout the next chapter, the possibility to reproduce images (first by photography and then with cinema) will be a further means by which enact that process of simplification and clarification meant to link science to public.

[30] Grasso 1988, p. 196.

[31] Between 1850 and 1920, the concern for the natural world emerged as a complex and broadly popular political and cultural movement in the United States. Newly urbanised Americans were becoming increasingly aware of the importance of nature as an economic, aesthetic, and spiritual resource, especially as they became convinced that nature's resources were imperilled by industrialisation. This movement led to unprecedented public and private initiatives to ensure the conservation of natural resources and wildlife and land preservation. By the turn of the 20th century, Wisconsin had become a centre of conservation thought and activity in the United States. The conservation movement was inspired by writers and artists such as Henry David Thoreau, Ralph Waldo Emerson, and George Catlin. The idea that some wild spaces had to be preserved for future generations began to take on great significance.

1.2.5 Popularisation in the 19th Century in Italy

During the first half of the 19th century appears in Italy a new way to conceive the education of citizens. That responds to the need of a popular literature (scientific too) of quality, able to contrast the publication of works admirable in their form but empty from the point of view of contents. A popular literature *ad hoc* is then invoked in order to help the reader to improve autonomously his judgement skills. The evolution of the Almanac is very important for this purpose, already enriched in the course of the 18th century with scientific, agricultural, geographical and historical sections. During the first years of the 19th century, a cultural and publishing "low-life"[32] consents through the Almanacs (sometimes thematic) to diffuse science also among readers that are extraneous to the traditional elites. Unfortunately, the almanac cannot prevent some professed scientists from publishing interventions that perpetuate superstitions and popular believes.

Aside from the phenomenon of Almanacs in some cities favoured by the publishing industry such as Milan and Turin, the condition of distribution and the weakness of the editorial market, together with the scarce professional preparation of the booksellers, prevent Italy from reaching the levels of England and France.
However, two important publishing realisations contribute to the spread of the scientific and technician culture, giving new impulse to popularisation and opening the way to new forms of communication among 'arts', sciences and the public of educated but not specialised readers. *La nuova enciclopedia popolare*[33] by

[32] Govoni, 2002, p. 74.

[33] Important encyclopedia published in Turin by Giuseppe Pomba in 1842, relevant example of scientific popularisation in Italy. This publishing operation, occurring during the age of the promulgation of the 'Statuto Albertino', met a great success. In his introduction Francesco Predari, referring to the divulging publications that preceded this encyclopedia, states: 'Ma queste collezioni, comechè giovassero a spargere un'istruzione generale, non potevano agevolmente andare per le mani di tutti, né erano compilate in modo da porgere un pascolo abbondante e vario, e soprattutto adattato alla generalità dei lettori, imperciocchè o troppo diffusamente si stendevano nelle parti scientifiche in guisa da divenire veri trattati su ciascuna materia, invece di limitarsi a darne compendiosamente l'essenza, o trascuravano la maggior parte delle cose usuali e più necessarie a sapersi, quasi che la dignità non permettesse loro di discendere a soggetti volgari'. This work was published between 1841 – 1849.

Giuseppe Pomba and *Il Politecnico*[34] by Carlo Cattaneo can be considered the journals that anticipate the stratification and multiplication of popularisation that would have occurred in next century with the advent of mass-media.

L'enciclopedia popolare addresses all the readers looking for a concrete and pragmatical knowledge. Realised by collecting parts of the main popularising foreign works, it is open to a public that does not only consist of noble people but of humble classes too. The *Politecnico* provides the theoretical justifications for a genre, the popularisation, hitherto largely practised but not legitimated yet in terms of cultural action of high level and useful to the scientific research itself, not only to non-experts.[35] According to Carlo Cattaneo popularisation begins to be an essential component of science and not a mere matter of translation or spread of knowledge.

Thanks to contribute of Pomba and Cattaneo, in the second half of the 19th century, popularisation definitely becomes an autonomous genre acknowledged by the publishing market too. After the unification of Italy (1861), two other authors reveal to be determinant in the process that makes science meet a vast public. The

[34] Il Politecnico - *Repertorio mensile di studj applicati alla prosperità e coltura sociale*, was a periodical founded in Milan in 1839 by Carlo Cattaneo. The publications began on the 1st January 1839 and were interrupted in 1844 due to the occurrence of some commitments for the founder, who had hitherto played a fundamental role in the editing of the journal. Under the direction of Francesco Brioschi in 1866 the masthead assumed a new subtitle ('Repertorio di studj letterari, scientifici e tecnici') and started to come out into two distinct parts, a literary one and a technical one. The first, guided by Romualdo Bonfadini, ended at the end of 1868; the second one joined in 1869 the 'Giornale dell'ingegnere civile e meccanico', to give life to the 'Politecnico. Giornale dell'ingegnere architetto civile e industriale'. The aim of the magazine, expressed by the subtitle, was explicitly announced in its first pamphlet: the intention of the founder was to 'appianare ai nostri concitadini con una raccolta periodica la più pronta cognizione di quella parte di vero che dalle ardue regioni della Scienza può facilmente condursi a fecondare il campo della Pratica, e crescere sussidio e conforto alla prosperità comune ed alla convivenza civile'. The magazine was then an overview of original studies and thorough reviews on disparate topics, from hard sciences to literary critique, unified under the common goal to favour the scientific-technological and civil progress of its readers. The contents were structured into the following categories: *-Physical and mathematical application, agriculture, technology, natural history, medicine, etc.; -Social Art, economics, law, history, administration; -Mental studies, educational methods, new institutes; -Fine arts and arts.*

[35] Govoni, 2002, p. 80.

zoologist Michele Lessona and the pathologist Paolo Mantegazza contribute, in their own way, to the acculturation process and to the spread of knowledge.

Michele Lessona[36] is one of the most important and prolific Italian scientific communicator between the 19th and 20th century. In his divulging activity, Lessona addresses an educated public with a discreet literary background lacking of scientific competences. According to the zoologist this is the target that popular science can reach.

> «Italy abounds of readers provided with a certain literary culture, lacking of any rudiments of scientific cognitions: for this reason I proposed to write and to rigorously avoid to mention any syllable that could not be understood by them.»[37]

His popularising works[38] are several and embrace different genres: from scientific texts and essays, to translations and literary works. His production was defined

[36] Michele Lessona was born in Venaria Reale (Turin) on 20th September 1823. He enters the Faculty of Medicine and Surgery, on 12th August 1846 he graduates. For a short time he practices the medical profession in Turin, then he moves to Egypt, where he runs the hospital of Khankah until the end of 1849. At his return to Italy he donates to the museum of Turin some exemplars of Egyptian reptiles. In that occasion he gets to know Filippo de Filippi, the new director of the museum, who convinces him to teach Natural Sciences in high school. He first teaches in Asti and then in Turin, committing himself in the intense study of natural history in order to teach it worthily. He publishes a series of treatises on Natural Sciences for secondary schools, remarkable for their clearness, accuracy and didactic method. He soon gains success, to the extent that in 1854 the university of Genoa asks him to hold the chair of Mineralogy and Zoology. At the same time he starts an intense activity of journalist for many newspapers of the time and of scientific populariser. He also writes little volumes destined to the education of the people. In Genoa he begins his research in the zoological field, dealing for example with hermaphroditism in fishes. However he is not an experimental zoologist, his interests are limited to the study of local faunas. In 1864 he is nominated full professor of zoology at the university of Bologna. He stays there only one year, since in 1865 returns to Turin to temporary substitute De Filippi, who had left with the Magenta scientific mission, and to remain definitely there as professor of Zoology and compared anatomy after the death of De Filippi, in 1867. His notoriety spreads over Italy when it comes out his translation of the 'Origin of Man' by Darwin (1872). From 1877 to 1880 he is rector of the university of Turin: he promotes the foundation of new scientific institutes and the creation of new chairs. In 1877 he begins his political career, first as town councillor in Turin (from 1877 to 1895), then as member of the *Consiglio Superiore della Pubblica Istruzione* (1881), finally as senator of the Reign (1892). Active until the last days of his life, Lessona dies in Truin on 20th July 1894, following up complications of a disease arisen two years earlier.

[37] Michele Lessona, *Conversazioni scientifiche*, reproposed in Govoni 2002, p 177.

"science for everybody". According to his view every scientist belongs to a larger group of researchers where nobody is an 'hero' or a 'sacerdotal of science', but where everyone has to collaborate to bring new discoveries and research data to the lowest levels and to women too (hitherto excluded).

Paolo Mantegazza, renowned and successful physician and anthropologist, risorgimental patriotic, is convinced that a young people, for ¾ illiterate, wants to grow and improve its conditions of life also by means of culture. The title of his first book for non-specialists, *Il bene e il male*. *Libro per tutti* (1861), immediately recalls its divulging mission. Medical popularisation, evolutionary anthropology

[38] Among his scientific works: *Nozioni elementari di zoologia*, Torino: Tommaso Vaccarino, 1867. *Storia naturale illustrata* (Vol. 1: I mammiferi; Vol. 2: Gli uccelli; Vol 3: Rettili, anfibi, pesci; Vol. 4: Animali invertebrati), Milano: E. Sonzogno, 1876-1891. *Il mare*, Torino: Tip. scolastica di Sebastiano Franco e figli, 1864. *Gli acquari*, Torino: tip. S. Franco, 1862. *La Pieuvre : cenni intorno ai cefalopodi : lezione serale detta a Torino il 4 febbraio 1867*, Torino: Tommaso vaccarino, 1867. *Dello arocatus melanocephalus fabr. in Torino*, Torino: Tip. e lit. Camilla e Bertolero, 1877. *Intorno alla Galleruca Calmariensis*, Torino: Tip. lit. Camilla e Bertolero. *Delle vipere in Piemonte*, Torino: Stamperia Reale, 1877. *Dei pipistrelli in Piemonte: osservazioni*, Torino: Stamperia Reale, 1878. *In Egitto; La caccia della jena*, Roma: Sommaruga, 1883. *Le cacce in Persia*, Roma: Sommaruga, 1884. With regard to the litarary production: Volere è potere, Firenze: G. Barbera, 1869. *Conversazioni scientifiche*, Milano: E. Treves & C., 1869-1874. *Naturalisti italiani*, Roma: Sommaruga, 1884. *Confessioni di un rettore*, Torino: Roux e Favale, 1880. *Carlo Darwin*, Roma: Sommaruga, 1883. His engagement as translator was also important since it notably contributed to scientific popularisation: Michael A. Foster, *Trattato di fisiologia*; 4 vol. traduzione con note per cura di Michele Lessona, Bologna; Milano; Napoli: F. Vallardi, 1882 Félix Archimède Pouchet, *L'Universo: storia della natura, narrata popolarmente da F. A. Pouchet*; tradotta da Michele Lessona, Milano: E. Treves, 1869. John Lubbock, *I tempi preistorici e l'origine dell'incivilimento*; Italian version by Michele Lessona; containing one chapter about the prehistoric man in Italy by the prof. Arturo Issel, Torino: UTET, 1878. Charles Darwin, *Viaggio di un naturalista intorno al mondo di Carlo Darwin*; first Italian translation with the approval of the author, Unione tipografico-editrice torinese, 1872. Charles Darwin, *L'origine dell'uomo e la scelta in rapporto col sesso* by Carlo Darwin; first Italian translation with the approval of the author, by prof. Michele Lessona, Torino, Unione tipografica-editrice,1859, Charles Darwin, *La formazione della terra vegetale per l'azione dei lombrici con osservazioni intorno ai loro costumi* by Carlo Darwin; first Italian translation with the approval of the author, by the prof. Michele Lessona, Torino, Unione tipografico-editrice, 1882. *La vita degli animali: descrizioni generale del regno animale*, by Alfred Edmund Brehm; revised by Michele Lessona, Torino, Unione Tipografico-Editrice, (1869?).

and preaching of a lay ethics melt thus into a multiform production[39], which for many decades meets an international success.

Passing through ancient literary genres, such as the almanac and the novel, and new ones, such as divulging periodicals about hygiene, or unscrupulous and at times swindling periodicals as certain 'physiologies', Mantegazza runs with determination and throughout his entire life after the reader. Initially intentioned to be understood by the farmer, as to reach in equal measure with his medical and hygienic precepts the worker and the wealthy, by time he admits to have been more useful to the middle class rather than the working class.[40] In spite of that he does not abandon what continues to represent the primary task of his activity, namely to reach any reader, invisible and impalpable, that average reader who *'has to give us bread and glory'*. [41]
After the unification in 1861, accomplice a renewed positivist attitude trustful towards progress, popularisation reaches not only the upper and already educated classes but also the lower ones. Still in the 18th century, several successful authors (Francesco Algarotti, Eusebio Sguaro, Antonio Cagnoli, Giuseppe Compagnoni) pay attention to what was happening in French and English popularisation, posing thus the base for the divulging process.[42]

By a process inaugurated by the invention of Gutenberg printing system, we come to the 19th century, when inventions and revolutions in the field of communication and science will re-define roles and methods handled by the interpreters of scientific popularisation.

---

[39] The production of Mantegazza consists of books, magazines and almanacs. After the publication in 1861 of 'Il bene e il male. Un libro per tutti', the physician founded and successfully directed the journal of high popularisation 'L'igea' (1862), 'Elementi di Igene' (1865), 'Almanacco igienico popolare' (1866), 'Amori degli uomini' (1886). A series of publications related to physiology: 'Fisiologia del piacere' (1854), 'Fisiologia dell'amore' (1880), 'Fisiologia del dolore' (1889), 'Fisiologia della donna' (1893). During his tireless activity as populariser, Mantegazza was also author of novels: 'Un giorno a Madera' (1868), 'Il dio ignoto' (1876), 'L'anno 3000: sogno' (1897) and 'Testa' (1887).

[40] Mantegazza, *Le fruste e le martinicche della vita*, p. 103.

[41] Mantegazza, *L'arte di campar vecchi*, p. 103.

[42] For further analysis cfr. Govoni 2002, p. 60-72.

> «The progress of the print revolution was slow but continuous and has culminated with the advent - between the 18th and 19th century - of the journal printed every day, the newspaper. At the same time, from the mid-19th century onwards, there is a different cycle of technological advancements. First the invention of telegraph, next the one of telephone. With these inventions the distance disappeared and started the era of immediate communications. The radio, an eliminator of distances too, adds a new element: an easy voice to be diffused to all houses. The radio is the first formidable diffuser of communications, but a diffuser that did not undermine the symbolic nature of man. Since the radio talks, it still spreads things put into words. Therefore books, newspapers, telephone, radio, are all - in concordance - bearing elements of linguistic communication.» [43]

The break occurs with the opportunity to reproduce images in movement. If the introduction of photography already unhinged the system of depiction and interpretation of reality, providing artists and scientists with a revolutionary recording tool, the creation of the first prototypes of cameras and projectors, mark a new way to record and diffuse science. The scientific cinema, developed in the 19th century after researches carried out by scientists all over the world, as well as giving an essential contribute in terms of technique and logic to the invention of the cinema, inaugurated a new way of making and spreading science through the images in movement.

1.2.6 The 20th Century

Starting from the 20th century science clearly emerges as a central tool for the capitalistic accumulation and the economical growth. Two main factors characterise research and popularisation in the course of this century. The first one is the opportunity of using the new technologies for recording and conveying the experimentations and the results of the studies. Already since the mid-19th century, photography had revolutionised the concept of reproduction of reality providing the experts with a new, important tool. With the advent of cinema, and next of television, the possibilities multiply and extend to the level of perception too. Scientists can employ relevant tools to link their researches to public.

[43] Sartori, 2007, p. 8.

The second factor is instead linked to the political and social valence of science. The 19th century is characterised by the awareness that scientific activity, on the base of its potentially powerful social impact, cannot be left only in the hands of scientists: the "scientific-technological" policy and the idea of *governance* make their way. Within that frame, the academic field begins to raise strong critics about the nature of scientific method and about which should be its prerogatives in respect to other forms of knowledge production.

If in the previous centuries the image of science as a mainly intellectual and elitist enterprise was dominant, starting from the last century the idea of a *techno science* detached from society and autonomous seems a utopia. For this reason many scientists decide that in order to be able to recalibrate studies and perspectives in the field of science, it is necessary to know the opinion of the non-specialists.

1.3 The Scientific Communication Today

With the spread of inventions and new technologies during the last century there has been a remarkable approaching between scientists (sender of knowledge) and public (receiver). If the first have progressively come out from their 'ivory tower' and have understood the importance of communicating also to non-specialists, the public opinion has started to get interested in issues often complex but with important effects in daily life.
The exchange between these two systems and distant worlds has inevitably required the use of channels (printed paper, cinema, TV, Internet), that somehow could facilitate the diffusion of contents encouraging a non-specialist public to learn. The passage from one system to the other, with consequent implications of semiotic translation, has required the popularisers (scientists, researchers, journalists and scholars) to develop proper techniques and languages for a correct communication without distortions. Each tool has its own potentialities and limits and when it comes to communicate science the devices that favour a better diffusion of contents need to be carefully weighed up.

> «Divulging does not mean to trivialise. A research article and a divulging one are two different things, not even commensurable. It is not true that the second one represents a bad copy of the first one: the recipients are different, and so the language and the abilities that have been necessary to build them. Popularisation, and not only the scientific one, represents a vital necessity in a modern society, since it consents the circulation of ideas outside the specialist fields. It concerns everyone, especially the educated people, the ones who want to understand their time.» [44]

After having traced the origin and the evolution of science communication, in the second part of the chapter I will individuate their interpreters, their role and the communicative model they rely on. That account is necessary in order to introduce the specific theme concerning the audio-visual scientific popularisation.

[44] Angela, 1998, p.142-143.

1.3.1 Sender and Recipient in Scientific Popularisation

Since its beginning, two main actors determine the exchange of information in communicating science, playing respectively the role of Sender and Recipient. On the one hand scientists and researchers, stimulated by different reasons to convey their knowledge; on the other one, the public, more and more willing to know.
The strategies to communicate the results of a study are for the scientists an essential part of the process of knowledge production, one of the most important in their work. Currently, the relevance of communication is to be found in the attempt to avoid the isolation and ward off the possibility to lead studies and achieve discoveries that would remain an end in itself. It is necessary to build an interaction with the territory where the researches take place and to build a capillary system of diffusion able to reach public opinion, not only for demonstrating the work that has been done, trying to assign it a social meaning and a concrete application, but also for guaranteeing the possibility to keep on the way that has been overtaken. To demonstrate discoveries, inventions or simple improvements in the study, allows purchasing the necessary funding for continuing the research.

> «Popularisation has been one of the tool used by scientists to communicate with colleagues of different disciplinary fields, sponsors and public opinion, in order to legitimate, discuss, introduce their work to people: popularisation has been used and it is still used to meet the approval of their research projects and consequently to find resources.»[45]

In spite of that important aspect, popularising their own work often represents for scientists grounds for inner conflict and controversy. Divulging a study most of the time means to reduce and especially 'translate' its contents, with the risk to misrepresent them. That is a process that not every specialist is disposed to accept.

> «Communicating science to make civil society understand the different degrees of certainty each laboratory result authorises; to estimate the degree of predictability of the events that it wants to produce or avoid; to discuss about the acceptance degree of unpredictability that human society considers governable, for then questioning about how to act. Communicating science to face ethical consequences, to verify the legitimacy of policies, to manage the governance processes. Therefore, not only popularisation as a genre

[45] Govoni, 2002, p. 37.

> of educated and spectacular entertaining, although useful and interesting, but as a primary public social function having the explicit aim to "better inform" the judgement of people.»[46]

For the public, the fact to get to know the scientific discoveries is determinant for a correct development of a democratic process and for the collective growth towards a society where findings and scientific revolutions can improve the life conditions of everyone. The civil society has the full interest to be aware of innovations and findings since most of the time they imply a series of practical repercussions in daily life. Moreover, if the communication is not unidirectional but it rather obtains a feedback by the recipient, the public judgement consents to recalibrate the route and invest on researches more coherent with the needs of society.
According to Giovanni Carrada, a scientific discovery or invention turns to represent news for everyone if the public finds it new, but most of all interesting. For this reason it has to touch a fundamental human need or a theme that is already of public interest.[47]

The notion of scientific public has been notably modified in the course of the years. From a peaceful and undifferentiated public that until the beginning of the 20th century used to follow science with fascination and interest, we now confront with a more attentive and critical public, heterogeneous and active. There are different typologies of public, which depending on situation and culture get in contact with different divulging forms assumed by science. Therefore it is not possible to refer to a pre-constituted public of science, as if it was prior existing, independently of specific places. To know the public to which science addresses is one of the fundamental prerequisite for making popularisation. To identify a precise target helps to understand which is the degree of complexity that can be reached in the exposition of the arguments, enabling to choose the proper form of communication.

[46] Donghi, 2006, p. 14-16.

[47] Carrada, 2005, p. 56.

Public Understanding of Science

Starting from the eighties the *Public Understanding of Science* has been an area of practices and studies looking at the complex relations between different scientific disciplines and different kinds of public. Spreading throughout the world, the PUS has a single task: to make the public understand science before that the shadow of irrationality spread like wildfire.

In 1985 in England a large group of researchers, under the guide of Walter Bodmer, signs a report for the *Royal Society* titled *Public Understanding of Science* (also defined Bodmer Report), which underlines that the citizens have to be aware of scientific themes. The benefits deriving from a systematic and structured scientific popularisation are represented by scientific, economical, military and ideological advantages, without disregarding cultural and aesthetic motivations too.[48]

Bodmer Report stresses the possibility to increase the degree of popularisation to resolve doubts and uncertainties. The scientists of United Kingdom are the interpreters of a change already under way to a planetary extent in the relations between science and politics. Since 1985, all the governments of industrialised countries provide themselves with agencies, groups and committees to promote the *Public Understanding of Science*.

> «Communication is consigned to the role of translation. Scientific popularisation is a peculiar case among the activities meant to convey knowledge: it is based on the assumption that the public it addresses is ignorant but that at the same time owns what has been defined a "libido sciendi". With this recipe not only Great Britain invests huge resources on popularising initiatives to communicate science. The PUS industry rapidly expands all over the world.»[49]

The important action of PUS, together with the continuous technological and communicative innovations, have rendered the scientific popularisation an extremely changeable field. Within the space of fifty years science, from being divulged almost exclusively through the written word, has come to benefit of an explosion of systems, means and practices that have fragmented the offer of scientific transmission. Within this frame, the analyses of the communicative

[48] Castelfranchi, Pitrelli, 2007.

[49] Castelfranchi, Pitrelli, 2007, p. 65.

models and of the actors involved in this process have revealed to be indispensable to grasp the phenomenon in all its facets: social, communicative and epistemological ones.

1.3.2 The Classical Model

The interacting elements in the practice of scientific divulging therefore are: the scientists (intended as "producers" of knowledge), the media (the institution in charge of conveying this knowledge, where the scientific communicator plays a main role) and the public (the recipient of the entire process).

Besides these communication actors, in his model Jakobson[50] introduces two more factors that consent us to understand how and why we are able to talk about something and to understand what is said. These are: the **code** and the **context**.
The *code* is a structured set of signs and rules the sender and the recipient have to share so that the first is able to formulate messages and the latter to understand them. Within the current communicative panorama, cinema, TV and the Internet can be seen in terms of codes. They own a specific set of expressive unities and a specific syntax (e.g. frame and editing) although they do not present all the characteristics typical of abstract symbolic languages, whose representatives par excellence are the spoken languages.

[50] Jakobson, 1993, p. 56-64.

Moreover, for the communication to happen, it is necessary a series of elements, for instance that the sender and the recipient share situation and time. To really grasp the message, the recipient needs to own some basic knowledge, a sort of cognitive context. When the populariser addresses the public, he takes for granted that the latter is somehow provided with the essential notions to understand his message. If this presumption reveals to be incorrect and for the recipient the communication is too complex, the task of the communicator is to explain through words (and with the aid of visual and filmed messages) at least one part of these contextualising notions. A perfect coincidence of competences between two persons is impossible, especially with regard to very challenging areas such as science.

For this reason, the linguistic communication and generally any communicative process between intelligent beings, mediated by a code enough complex as the audio-visual one, can never reach a perfect harmony between encoding and decoding. Decoding always implies a process of interpretation, carried out by the recipients in the light of a set of competences and circumstances.

1.3.3 The Scientific Populariser

In order to facilitate the transmission of the message through the media, the passing of time and the technological specialisations gave space to a professional figure able to divulge by using the selected tool with competence: the scientific populariser. Journalist, expert or scientist who decides to disclose his studies, the populariser has the role to create a bridge between the specialistic world and the public opinion, offering accessible contents without distorting the key concepts of the issue at stake. Carrying out what linguistic calls transmutation, the populariser has at disposal various opportunities and communication tools for a specific degree of simplification. All the choices are taken depending on the channel used and the reference target.

There are two typologies of scientific communicator: scientists and journalists. The scientists who decide to convey their knowledge to the public have the possibility to employ with competence the skills in their field but they often lack a proper command of the communication tool. It is not enough to know the subject, it is necessary to be able to elaborate it in order to make it understandable and interesting. To be understood by who watch TV, read the newspaper or serf the Net, it is necessary to handle the techniques meant to elaborate the concepts and make use of the communication tools.

From time to time journalists have the task to study and explore the topic they want to deal with. In this case, their commitment will be to fully consider all the elements to be analysed and metabolise them to be able to provide a proper popularisation. Journalists are advantaged for having a major ability and familiarity with the communication tool they use and they try to compensate for their lacks by yielding to the spectacular or, increasingly often, by interviewing experts, demonstrating their mere role of mediators and facilitators of knowledge.

A valid scientific communicator has to be able to condensate the peculiarities of these two figures, the scientist and the journalist. He needs to know what he is talking about and to be aware of the relative techniques to expose it in a simple and engrossing way.[51]
Simplicity is not at all harmful. Here is how it is possible to unify the heterogeneity of the public preparation: on the one hand by talking in a clear and plain way, on the other one by telling news.[52]
The combination, within a single figure, of the mastery of both scientific contents and the communication tool, corresponds to the balance that has to be searched between scientific accuracy and spectacularisation when the divulging relies on means such as newspapers, cinema, radio, TV and the Internet.

[51] Angela, 1998, p. 136.

[52] Angela, 1998, p. 53.

1.3.4 The Translation

As we have seen, the main role of the populariser in the media is to *translate* specialist concepts into an accessible language. Reconsidering the model of Jakobson[53] it can be said that the populariser has at disposal three kinds of translations: the *reformulation* (inner-linguistic), the *translation* (inter-linguistic) and the *transmutation* (inter-semiotic).

The *reformulation* is a passage, a difference within the same language (from L1 to L1). It consists in saying the same thing by using other words. When you premise expressions such as "in other terms", "in plain words", "to put it simply" or "in essence", a certain concept is reformulated in order to express it differently and make it clearer.

The *translation* is the passage from one language to another (from L1 to L2). For instance, when you translate from English to Italian you do translate.

Finally, the *transmutation* occurs when there is a passage from a semiotic system to another one (from S1 to S2). In this case what changes is the matrix of expression and it is necessary to recur to an adaptation in order to produce a new work (for instance the passage from novel to film).

As it can be seen, each of these passages implies a loss of the original meaning due to the reformulation of concepts. Especially the transmutation implies at the same time the privation of some constitutive elements and the enrichment due to the new chosen language, in order to arrive at a final message that will inevitably differ from the original one but that will be able to display notions and results under a new light.

> "There are concepts made inaccessible by a barrage of words. They are not difficult in themselves, at least to the level of a general idea, but they become difficult if they are presented by an obscure language, unnecessarily complicated. The question is then to translate, to make a useful work of simplification. That does not mean to trivialise or artificially erase the complexity. Nearly always, the essential ideas, the basic concepts can be

[53] Jakobson, 1993, p. 56-64.

> explained and become understandable. What cannot be divulged are the details, since at that level, comes into play a complexity that is hard to tackle with the exposition techniques."[54]

To know the three typologies of translation is important to comprehend the opportunities available for the scientific communicator. As highlighted by Pino Donghi in his essay *Sui generis*, [55] when dealing with popularisation, reformulation, translation and transmutation can enter the scene at the same time. Starting from a scientific text appeared on an English magazine, I make a translation (L1 – L2) to bring it into Italian. Next, trying to simplify the concepts and express them with an accessible language to a non-specialist public, I make a reformulation (L1 – L1). Finally, having at disposal a clear and simple text, which has maintained its key elements and scientific validity, I can decide to expose the issue through a television report or a documentary, making a transmutation, that is a passage from a semiotic system (written) to another one (audio-visual). In this case the transmutation (S1 – S2) will require a specific adaptation.

> "To transmute, in this sense, is a creative work, not mechanic. You need to invent a proper structure to consent the exposition of a complex topic in a gradual way, according to progressive approximations. You need to find the proper language, to make it graspable and interesting, to create the right metaphor, to individuate the clarifying example. You need to grasp the heart of the matter, the fundamental relations, without getting lost in the details. It is then necessary to be able to prune, to skip what is useless, for you do not have to exactly reproduce what you have been studying, but to re-elaborate it within a new shape, suitable for a different recipient." [56]

1.3.5 The Model of Continuity

The presence of the scientific communicator, who through the different forms of translations means to mediate between pure science and the public, has consented

[54] Angela, 1998, p. 92.

[55] Donghi, 2006.

[56] Angela, 1998, p. 137-138.

some scholars to re-edit the classical model of communication into a new one called *model of continuity*.
In 1985 two American researchers, Shinn and Whitley,[57] have elaborated this new model by taking into consideration new means of communication employed by specialists (TV, radio, cinema) and establishing a continuum between different contexts and styles of communication/reception that inevitably exist in the exposition of scientific ideas.[58]

According to the model of continuity it is necessary to redefine the term 'popularisation', which is no longer merely associated with a transmission of concepts but it is rather related to a series of levels linked one other. The public is no longer a wide, undifferentiated and passive entity, with scarce ability to elaborate, like so the scientific community does not present it self as a distant world with no chance of dialogue. To summarise, the communication is no longer vertical and unidirectional, but there are also horizontal exchanges and for the first time have to be taken into account the communicative processes between equal subjects, provided with the same know-how.

> "This 'standard view' of popularisation stems from a conception of the scientific community as a cohesive, autonomous, 'paradigm bound' entity which generates esoteric knowledge that is only communicated to non-scientists with great difficulty. These non scientists are viewed as a mass of undifferentiated and disorganised people whose distinguishing common feature is simply their lack of participation in the knowledge production and validation process. Thus the 'popularisation problem' is viewed as the Herculean task of transferring true knowledge produced by a highly organised and systematic activity to a large, vague and indeterminate audience. Not surprisingly, this "problem" then seems impossible to be resolved."[59]

The schematic relation Science – Media – Public is redefined in favour of a model that takes into account the potential recipients and the multiple complexity degrees of popularisation itself. By the redefinition of the communicative system presented

[57] Shinn, T.; Whitley, Richard P., 1985.
[58] Bucchi, 2000, p. 9.
[59] Shinn, Whitley 1985, p. 62.

by Cloitre and Shinn,[60] can be individuated four potential levels of scientific communication.

1. The **Intra – Specialist** level. The highest level where a theory or scientific data can be produced. The communication addresses the experts of the field area. The classical example is the article of scientific journal or the presentation during a congress. The language is impersonal, without narration and specialised; simplified syntax and rigid semantic, strictly professional. The figures of speech are absent but there are several references to the experimental activities and empirical data related to the research.

2. The **Inter – Specialist**. The communication addresses scientists and researchers of other scientific areas too. We are still inside the scientific community but in this case the language allows some digressions and conceptual simplifications also through the use of metaphors. The text is closer to represent the concepts in a "concrete" way. The channel used at this level may be an article published on "review journals" or "bridge periodicals" such as *Nature* or *Science*.

   "Today this day the scientist does not exist. Scientist means nothing. There is the mathematician, the physician, the geologist, the astronomer, the chemist and so on. If they want to have information about other sciences, they have to recur to popularisation, even if it is high popularisation." [61]

3. The **Pedagogic** level. The communication addresses a non-specialistic public. Notions and theories are shared with a public that does not fully handle a specialised lexicon. In this case a certain degree of simplification is necessary in order to convey the contents. The form is linked to an educational model that may consent people to learn. The scientific paradigm[62] is fully present. This modality occurs in the case of university didactic or advanced teaching, where regularity and formative character join an historical perspective, which invites to consider the cumulative nature of the scientific enterprise. It is also defined as 'textbook – science'.[63]

4. The **Popular** level. It is the lowest level addressed to public, the one

[60] Cloitre, Shinn, 1985.

[61] Bianca, Rigutti, Santaniello 1985, p. 120.

[62] Khun, 1999.

[63] Fleck cit. in Bucchi 2000 p. 9.

> normally defined as popularisation. A rather wide area where can be found subjects united by the desire to know even if not bearing specialised preparation. In this case there is the highest linguistic simplification through the use of metaphors and examples. We have television programmes, documentaries, highly acknowledged thematic magazines such as the *Scientific American* but also periodicals dedicated to a more generic public such as *Focus* or *Newton*.

With regard to the motivations and characteristics of the three main actors detected by the classical model (Scientists, Populariser, Public), we can note how in this model the articulation is definitely more complex and stratified. The first two levels present a kind of transmission where the degree of formalisation and technical accuracy is highly specialist. At these levels the communication occurs among operators of the scientific or academic field, the recipient has then a high level of preparation and cultural background. At the pedagogic and popular level instead, the public is larger and heterogeneous and may need more simplifications.

Tracing a cognitive line of scientific information, many times the same study can be conveyed at all the four levels presented, namely a synchronous approach can come along with the sequential perspective of different stages. For instance, an invention or the results of a research can be published and contemporaneously appear on articles of specialised magazines and under the form of television reports, periodical articles, scientific documentaries or Web articles.
However the possibility to channel the informative scientific flow according to a reference target is not exempt from obstacles. According to Cloitre and Shinn it may occur that some ideas do not find the right exposition at one of these levels. To describe the process preventing the passage of some concepts from an expositive stage to another, the two sociologists introduced the term crystallisation.

As indicated by Bucchi, the message has not necessarily to go through the four stages in sequence starting from the highest one (intra-specialist) to arrive to the popular one, also because a good outcome of each passage is not always assured. Indeed it may happen that the scientific information suffers some modifications, even substantial, during the shifting from one level to another. This effect is due to

a different reference target and so to a different modality of diffusion of knowledge that may undermine the accuracy and reliability of scientific contents.

With regard to the reference target, that is the public addressed in the communication of science, the model of continuity reformulates the role of sender and recipient within the communicative process. Both at the pedagogic level and at the popular one, the public opinion, with its responses, critical attitudes and behaviours, can modify the routes of the research. Sometimes the community of insiders cannot solve scientific controversies or ethical debates. For this reason it is required the intervention of the public to determine which direction has to be taken. Divulging science becomes therefore not only an entertaining genre, sophisticated and spectacular, but an opportunity to widen the choices and the opportunities to build the desired future. The communication of science serves therefore to continuously rebuild the bridges between what we knew and what has just been discovered, constantly updating the social representation in circulation.[64]

> "The popular stage can in this sense provide an open space where stimuli, ideas and information may be merged and exchanged among different actors and across disciplinary fields, in the absence of the constraints and conventions which bind scientific work and communication at the specialist level." [65]

1.3.6 The Audio-Visual Popularisation

According to what has been said so far, communicating science is today a practice that implies determinant choices within the range of available possibilities. Focusing the analysis on audio-visual popularisation we need to take into consideration three fundamental elements that I have introduced in this chapter and that will be further explored in the next ones.

[64] Carrada, 2005, p. 51.

[65] Bucchi, 2000, p. 386.

1. The first element is the **transmutation**. Starting from a scientific text, the communicator is offered several possibilities for reinterpreting and conveying its contents. As we have seen, at the inter and intra-disciplinary stages the language is impersonal and has no narrative digressions. The communicator using the video has to transform the audio-visual language and make it accessible to a large and non-specialist public. To do that he will have to translate the concepts as much clearly as possible, without forget to encourage the interest of the public. The news may indeed be not enough important in itself. It is important to be able to transform what you want to express into what the public wants to know, nourishing that motivation characterising the intra- and inter- stages. With this regard the capacity to visualise the concept is fundamental.

2. The second element is the attempt to find a **balance and a form of integration between scientific accuracy and the spectacular**. Every time you create and elaborate a scientific video the challenge is to make the knowledge interesting and gripping through the audio-visual language, which besides its contribute in clearness and "multisensoriality", has to be also used for the spectacularisation. At the same time, the transmission of scientific knowledge requires to adhere the basic concepts, which cannot be distorted, misinterpreted or even worst, forgotten. That means to convey ideas entertaining or at least avoiding to bore.

3. These two elements are strictly related and often determine the **choice** of the audio-visual **channel**. In this case the decision will mainly be linked to two factors: the public to which the message is addressed and the topic that is treated. Cinema, documentary, TV and Web-video, although using the same language (images in movement), have their own grammars and codes that confer a different degree of elaboration of the themes (also in relation to times and rhythms).[66] The choice of the channel implies the need to create different videos.

[66] In chapter 4 the analysis of different AV models highlights potentialities and limits of each channel in the communication of science.

In the next chapters I will present and analyse the different audio-visual forms available for the transmission of scientific knowledge. It will be important to establish how cinema, documentary, television programmes and Web-videos present their contents; which codes they use and how they convey even complex concepts to a large and heterogeneous public.

The scientific cinema, which has developed long before the entertainment cinema, represents the historic ground that fosters the language of moving images. It constitutes a new and still underrated dimension within the range of human possibilities to perceive and communicate by means of a code that extends the ones previously used (the gestural, verbal, written, figurative and representative code).[67]

2

The Scientific Cinema and the Documentary

2.1 Introduction

During the 19th century, under a climate devoted to research and progress, the image comes to assume a prominent role by virtue of its capacity to document, register and divulge facts and phenomena. The several inventions of this century, among which the one of photography and cinema, were facilitated by the ever growing demand of innovation triggered by the industrial revolution. The great historical upheaval, as well as producing significant social, economical and anthropological transformations, had created the conditions for a variety of scientific and cultural revolutions. The spread of inventions and new technologies, which had also affected the attitude to read and face reality, involved two main 'figures': on the one hand the artists, who tried to bring in their work a higher level of verisimilitude by recurring to science, on the other one the scientists, who began to use the new visual forms in their researches.

For anthropologists, physicists, biologists, as for physiologists, the photography first and cinema later, allowed a newfangled and figurative way of recording the

[67] Virgilio Tosi, 2007.

events that was able to fix, summarise and explain the contents of the research, with no need to rely on verbal elaboration.

In confirmation of the absolute importance the image and its recording and reproduction gained as of the mid-nineteenth century, Virgilio Tosi[68] outlines the simultaneous process leading scientists from different countries to create similar devices meant to record: the Thaumatrope[69] by the English scientist Fitton, the *Wheel of Faraday*[70] the *Phenakistoscope*[71] by Plateau from Belgium, the *Disco Stroboscope*[72] by Stampfer, Viennese, the *Zootrope*[73] by Horner.
This simultaneous initial step, involving different countries and disparate disciplines, was fruit of a communicative urgency that needed to transcend the

[68] Tosi, 2007.

[69] The Thaumatrope can be considered the first optical toy. It was realised first by Fitton in 1825 and it spreads in England since 1826. It is a simple toy based on the illusionary optical overlay that is formed between two pictures drawn on the two faces of a little disk made turning around itself through elastic bends or ropes. The Thaumatrope does not move but simply transforms two different images into a new one thanks to an "illusionary identification". It is the first step of a long path: the phenomenon of the persistence of the image on the retina is materialised in a toy, an initial understanding of the illusion of movement.

[70] The wheel of Faraday, named after its author, was invented in 1830 as part of some researches in physics and it consists of a toothed wheel that when spun quickly in front of a mirror produces an incredible optical effect. The image obtained on the disk, reflected on the mirror and visible through the fissures, not only does not vanish for the rapid circular movement, but it even appears still. At the time of its invention, the Faraday's wheel was mainly employed in the physics area and it was diffused for the optical illusion it was able to origin.

[71] Designed in 1832 by the Belgian physicist Joseph Plateau (it is also said that it was invented by a professor of geometry, Simon Stampfer). The Phenakistoscope was formed by two rotating disks containing pictures slightly different from each other, when spun they gave the idea of movement.

[72] Similar device to the Phenakistoscope of Plateau realised by the Austrian Simon R.Stampfer in 1833, professor of applied geometry at the Polytechnic of Vienna. By virtue of his scientific training, Stampfer directs the use of its stroboscopic disk to the analysis and reconstruction of the mechanic movements (e.g. systems of gears) and to the research in the field of physics.

[73] Elaborated by William George Horner under the name of Daedalum in 1833. It is a cylinder perforated on its sides presenting openings equally spaced. Each drawing within the spaces between the openings is visible through the fissures on the opposite side. If these pictures reproduce the sequential phases of an action, it will be obtained the same movement effect as the one produced by the disk of *Phenakistoscope* in front of the mirror. There is no need to draw up the eye to the device: when it turns it looks transparent and many people at the same time can admire the phenomenon.

written word. The birth of cinema, namely the possibility to record and project moving images, marked a great leap forward in reading and reproducing reality.

> «The inadequacy of our perceptions has represented for thousand years an insurmountable limit. Galileo had even to struggle for the visual enlargements provided by the telescope to be acknowledged. From the moment the horse-steam seemed to be able to multiply indefinitely the production of human labour and the voltaic pile guaranteed a new form of energy for the future, scientists had no doubt about the possibility, indeed the need, to extend the narrow limits of our senses.»[74]

The first part of this chapter presents the features and describes the techniques that in the second mid of the 19th century contributed to the development of scientific cinema. Apart from being the "fathers" of the cinema, presented by Lumière brothers in 1875 in Paris, Janssen, Muybridge, Marey, Regnault, to whom followed inventors in specific scientific fields, were also the ones who experimented for the first time a new form of making and popularising science. It is important to have knowledge of their inventions and of the first rudiments in the scientific audio-visual communication in order to know the ground wherein has developed, together with the technological progress, the popularisation of science.
After them and throughout the 20th century, the film used in the scientific field has been enriched by new modes of production and fruition of dynamic phenomena. From making science relying on new recording technology, to its popularisation through the reproduction devices, the step was short, often simultaneous.

The second part of the chapter focuses on the analysis of different documentary typologies, a genre which several popularisers use to convey scientific contents.
Risen at the same time as the fiction cinema[75], the documentary has developed throughout the 20th century, showing a great flexibility and many possibilities of application in different contexts, with its own styles, rhythms and grammars. After an account for the different kinds of this audio-visual, by referring to some

[74] Tosi, 2007, p. 199.

[75] Some historians underline how the first films of Lumière brothers were closer to the documentary than the fiction film. It was Méliès who first introduced "fictional" features (screenplay, scenography, effects) in the cinema.

representative works, I identify the possible uses of each form of it in scientific popularisation.

2.2 The Origin of the Cinema of Science

Since the twenties of the 19th century, the visual perception and more specifically the persistence of the images on the retina during dynamic phenomena, represents one of the main research theme the scientists deal with[76]. In order to study this phenomenon, in different countries are devised instruments enabling the reproduction of movement. These are provisional devices able to realise optic illusions through the rapid succession of images and they are the instruments by which develops what would become the scientific cinematic experience. Indeed, besides being relevant on the level of physiology and for the understanding of the physic process of vision, these works are relevant in order to reassemble the movement starting from still frames. The "historical motive" of the first appearance and development of these techniques has to be found in the new role assigned to the studies on movement (both physiologic and mechanic) in a time of progress for the industrial society.

> «There is the promising reality of the new energy sources (the steam and later on the electricity) that emancipates the work from the human and animal muscular effort, it arises the myth of machine as a tool of progress (before that the question about its effect on the workers would have been taken into account). Machine means movement, and movement for the scientist means the study of movement. This is the key reason why these experimentations and studies had been carried out several decades before the invention and diffusion of photography.»[77]

The advent of photography[78] in 1839 is the event that completes the process introducing to the scientific cinema. Although initially the first photographic techniques are, for exposure times and quality, far from being able to reproduce movement, over the years and thanks to increasingly rapid improvements, photography turns to be an essential component within the studies on recording devices and the process of reproducing phenomena.

---

[76] Among the scientists who significantly contributed to these studies we remember Peter M. Roget (London, 1779- Worcestershire,1869), English doctor and mathematician.

[77] Tosi, 2007, p. 52.

[78] The official inventor of photography is Louis Jacques Mandé Daguerre (Cormeilles-en-Parisis, 1787 – Bry-sur-Marne, 1851) in 1839. The photographic method introduced by Daguerre has been refined over the following decades.

2. The Scientific Cinema and the Documentary

> «Since the moment of its appearance, photography has instilled a trust that today surprises for how still approximative were the results obtained and how the "resemblance" was uncertain. But this was sufficient to enthusiasm the scientific environments, probably more trustful of the machine itself than of its provisional efficiency. Very soon that raised a debate among the ones who wanted to direct the new invention to art and those who first acknowledged its adherence to the model. This controversy, based on the opposition between art and accurate reproduction, foreshadows for some aspects what would have appeared much later on about the notions of fiction and documentary.» [79]

What is certain is that the photographic technique enters greatly the process of reproducing images in movement and soon enables to achieve that sense of verisimilitude which still represented a deficiency.[80]
Starting with 1870, several scientists, technicians and authors, give life to the first form of scientific cinema. It is a process that develops during a period marked by the contribution of different people in different countries, and within which it is not possible to identify a unique date as we can instead infer for the birth of the cinematograph.[81]

2.2.1 Pierre – Jules – César Janssen

Jules Janssen (Paris, 1824 – Meudon, 1907) is a French astronomer supporting the use of photography for recording scientific events ("Photography is the scientist's retina"). His attitude to innovation leads him to conceive and realise a device for the visual recording of an astronomical event. In 1873 he communicates to the *Académie des Sciences* in Paris his intention to use a system invented by himself and called "photographic revolver", for recording the phases of transit of Venus across the Sun.

---

[79] Guy Gauthier, 2009, p. 48.

[80] One of the first who used photography in his reproductive devices was Plateau in 1849.

[81] On 22th March 1895 Lumière brothers project their first film for a private audience in Paris. Many historians indicate *La sortie des ouvriers de l'usine* as the first cinematographic film. Several months after, on 28 December 1895, in a room at the Grand Café – Boulevard des Capucines in Paris, Lumière brothers officially present their invention in front of a paying ticket public. Ten short films in succession (among which: *L'arrivée d'un train de gare, Dejeuner de bébé, L'Arroseur arrosé)* represent the birth of cinema.

> «It is known that the observation of the contacts will play a primary role in the observation of the transit of Venus...It is then clear the interest in fixing these contacts by photography...I had the idea to realise, in the moment when the contact is about to come, a series of photographs at very short and regular intervals from each other, so that the photographic image of this contact is necessarily included in the series and at the same time gives the exact instant of the phenomenon. I could solve the problem by the use of a rotating disk.» [82]

The photographic revolver, designed by Janssen and built by the technician Redier, with its odd aspect "howitzer shaped", is regulated and moved by a clockwork. The shutter disk completes a full circle in 18 seconds, while the wheel carrying the slab is geared down four times, that is, it completes one circle in 72 seconds, but it only moves at intervals when the shutter is closed and the portion of slab already recorded has to be moved to collocate in front of the window the new portion of slab to be registered.[83]

Conceived for alternate shooting (48 images in the short interval of 72 seconds), it is employed in Yokohama in December 1874. The quality degree of the recorded images is apt to document the phenomenon with scientific accuracy.

Janssen's technique is for many aspects similar to the one nowadays defined 'time-lapse filming'[84], namely a series of photographs in succession detecting the movements of an object in the space. Janssen's photographic revolver represents indeed the "embryo" of a downright scientific camera: it has a motor, an optical system, a variable shutter, a material sensitive to movement.[85]

The experiment of the photographic revolver represents the first scientific research that used cinematographic techniques. Jules Marey says:

---

[82] 'Comptes rendus des séances de l' Académie des Sciences', Paris, Tome LXXIX, séance du 6 juillet 1874, reported by Virgilio Tosi, 2007, p. 62.

[83] Tosi, 2007, p. 63 – 64.

[84] The time-lapse photography is a cinematographic technique in which the capture frequency of each frame is much inferior than the reproduction one. Due to this discrepancy, the projection with a standard frame rate of 24 fps, makes seem time running faster than usual. A time-lapse shot can be obtained by processing a series of photographs shot in sequence and properly edited. By this cinematographic technique is indeed possible to document events that are not visible at naked-eye or whose evolution in time is weakly perceptible by the human eye, as the apparent movement of the sun and the stars in the sky, the rhythm of seasons, the movement of the clouds or the blossom of a flower.

[85] Tosi, 2007.

> «It was Janssen the first to think, with a scientific purpose, to automatically record a series of photographs in order to represent the subsequent phases of a phenomenon. To him is then due the honour to have inaugurated what today is called cronophotography on mobile slab.» [86]

Janssen himself is deeply convinced of the validity of his revolver in the scientific field. He is aware that new terrains can be explored in the research and suggests specific directions on the potentialities and the uses of the device of his own invention.

> «The property of the revolver to automatically give a series of images as much as numerous and as much as close as required of a phenomenon that is rapidly changing, will allow to tackle the interesting problems of physiologic mechanic concerning the deambulation, the flight and the different animal movements. A series of photographs that analyse the entire cycle of movements of a certain function could furnish precious indications to illustrate the mechanism. It is evident, for example, the profound interest that would have, for such an obscure problem as the one of birds flight, a series of photographs showing the different movements of the wing during the flight.»[87]

Few years later the works of Muybridge and Marey confirmed the possibilities of scientific cinema foreseen by Janssen in relation to the study of dynamic phenomena.

2.2.2 Eadweard James Muybridge

Eadweard James Muybridge (Kingston upon Thames, England 1830 – Kingston upon Thames, England 1904) was an English photographer who through his experimental shoots and his study on the methods of projecting images gave a crucial contribute to the advent of cinema.
During the first part of his career he was not only a photographer but he also dabbled as craftsman, artist, technician and most of all, traveller.
After moving to the States in 1860, he designs a washing machine and a tire clock able to control remotely several quadrants. With an adventurous spirit he takes part

[86] Etienne –Jules Marey, *Le mouvement*, Paris 1894, p.102 cited in Tosi 2007, p. 67.
[87] Jules Janssen *Bulletin de la societe Francaise de Photographie*, Paris 1876, cited in Tosi 2007, p.68.

to the official missions of the United States government, exploring barely known areas as the Yosemite Valley and Alaska. Moreover, hired by the "War Department" he photographs the last battles between Indians and federals during the Modoc war. In 1875, after he spent several months in prison for having killed his wife's lover, he leaves for a long voyage by boat during which he takes many pictures of uncontaminated landscapes in Mexico, Panama and Guatemala.

Back in San Francisco he realises, through a series of plates set side by side, a panoramic of the metropolis. The work earned him an international recognition from important scientific communities. The achieved success enables Muybridge to establish an agreement with an important patron from Stanford for a series of photographs meant to conduct an analysis on the movement of a horse.
In the summer of 1878 (USA), Muybridge places parallel along the take-off strip of Palo Alto 24 cameras. Each of them is connected to an invisible and fine string that as hit by the horse's chest at gallop, it brakes causing the activation of the shutter.
The photographs were shot at intervals of 1/25 seconds, each exposure is about 1/2000 a second, and the size of each image is similar to a modern 35 mm negative film. The sequence of six photographs, at that time called 'automatic electronic photographs', is published on a catalogue entitled '*The Horse in motion*'. The images taken by Muybridge quickly go around the world. They consent to see the different stages of the rapid movements of a race horse, event that the human eye is not able to register.

The news about the results achieved by Muybridge raise interest and curiosity not only in horse racing and sports environments, but also in the scientific and artistic world. The first authoritative publications appear on two of the most prestigious journals in the field of culture and popularisation: *Scientific American* (a first article is published on 27th July 1878, another one, followed by cover illustrations, is published the following 19th October) and *La Nature* (14th December). [88]
After the success of his first experiment in automatic electro-photography, Muybridge tries to implement and deepen his studies by taking photos of other

[88] Tosi, 2007.

animals as well as athletes during various sport activities in a club of San Francisco.

Meanwhile, some French magazines reflect on the possibility to animate the photographic serial production. In April 1879, the Parisian journal *Illustration* attaches to its number a *Zoetrope*[89] allowing to animate some paper strips with the phases of the trot and the gallop of a horse.

The same Muybridge is involved in the animation of his shots and in autumn 1879 he presents a device of his own invention: the Zoopraxiscope. It consists of a "magic lantern[90]" for projecting where have to be inserted -between the source of light and the objective- two concentric disks running in the opposite direction. One of the two disks, made of metal and provided with small windows, served as a shutter; the other one, made of glass, carried the series of images which cyclically repeat every time the full circle is completed. Although still at an embryonic stage and limited to the tasks his author aims, the Zoopraxiscope definitely prefigures the

[89] The Zoetrope (also called Daedalum or Wheel of life) by William George Horner is the precursor of the cinematographic machine for projection able to reproduce the vision of imaged in movement. It was an improvement of the *Phenakistoscope*. Instead of being printed on a disk and being seen on a mirror, the images were represented on a paper strip that could afterward be put in a paperboard or metal drum and observed directly from the fissures notched on the side of the cylinder. On a communication appeared on January 1834 on *London and Edinburgh Philosophical Magazine* Horner wrote: 'Since in this case it is not necessary to draw up the eye to the device but rather the opposite and when the machine turns is completely transparent, many people at the same time can admire the phenomenon in all its aspects'.

[90] The magic lantern is a form of images projection (usually on glass) depicted on a wall (or on a screen predisposed on purpose) in a dark room, through a closed box containing a candle, whose light is filtered by a hole on which is applied a lens. The procedure is essentially very similar to the one of the modern slides projectors. It is the closest pre-cinema device to the cinematographic current spectacle. The oldest description of a magic lantern dates at 1646, when the Jesuit father Athanasius Kircher included it in the book *Ars Magna Lucis et Umbrae*. However at that time the instrument should have been probably already known at the European courts, imported maybe from China through the mediation of Arabs. The diffusion of the magic lantern was rapid and had two main applications: a didactic one and an imaginative one. In the first case it was used to show places, monuments, objects, plants, animals that nobody had never seen before, with a much more suggestive effect than print; in the other case it was used to project fantastic images, as well as aid to conferences and sermons (the punishments of the damned people in the fires and the blessed ones in paradise as support to the explanation of the verses on the crack of doom). The two aims could also be strictly bounded, to enhance the teaching and developed imagination.

modern cinematographic projector.[91] It is important to underline that the figures projected are not real photographs but drawings, at times coloured and copied on glass.

Gaston Tissander reflects on the effects produced by the Zoopraxiscope on an article from *La Nature* (1st April 1882):

> «The effect is extraordinary: the real movement is seized on live; to the physiologist, from a scientific point of view, and to the painter, from an artistic point of view, are opened up innumerable cues of study. There is material for teaching and feeding the curiosity of everyone.»[92]

These words condense the relevance of the research carried by Muybridge. His inventions are fundamental to the integration of the moving images in the process of popularisation.
After the publications Muybridge is involved in conferences and lectures where he explains the new photographic and projection techniques. A dense series of events leads him to travel intensively and to confront with scientists and specialists establishing valuable professional contacts. In 1883 the University of Pennsylvania offers Muybridge the possibility to realise one of the project he is working on and for which he seeks funding: a new series of photographs on the motion of humans and animals aimed to explore the study of locomotion.
Between the spring of 1884 and the summer of the following year, are impressed more than twenty thousand negatives.
First Muybridge focuses on human subjects and repeats some shots with horses, using the 'film studio' set in the triangular garden of the university veterinary institute; next he moves to the zoological garden where he takes several shots of many animals in movement and tries to record the flight of birds, binding them to a rope enabling them to take wing.[93]

[91] Tosi, 2007.
[92] *Nature*, 1st april 1892.
[93] Tosi, 2007, p. 98.

In 1887 Muybridge publishes 781 plates in eleven volumes titled *Animal Locomotion*. The work is also sold to important universities and scientific institutions among which Princeton, Yale, Oxford and Cambridge. The importance of publishing and diffusing the plates is linked to the revolutionary novelty of the visual approach. The possibility to analyse and compare the movements of women, men and animals represents a sudden source of study for physiologists, zoologists, anatomists, physician and veterinarians. Also some artists of the time (painters and sculptors), which since then have reproduced approximately the instants of a run or gallop, are able to recalibrate their representations.

2.2.3 Etienne – Jules Marey

Etienne – Jules Marey (Beaune, 1830 – Paris, 1904) was an important French physiologist and inventor. After graduating in medicine in Paris, his interest in the analysis of movement (human and animal motion) leads him to make use of a huge variety of techniques developed in this time of scientific progress in order to deepen and improve the research within the field of physiology. Marey elaborates an innovative methodology of research based on the use of new widgets and devices, often of his own invention. Recording and studying moving subjects is what stimulates the French physiologist, who in an article published in 1878 titled *The graphic method in experimental science*, states:

> «When the movement changes every instant; when, assuming at each fraction of second a different course, it challenges the eye willing to follow it, the thought willing to analyse it, would it then slip to the physicist? Not at all! Here it is recorded by a device and fixed on paper. It has then to submit to the ruler and compass. Just now it has flown and now, prisoner, reveals itself the laws governing it. It is possible to understand it!»[94]

The strict experimental style of his method leads Marey to point to the urgency to dispose of the appropriate tools for analysing the phenomena and their recording

[94] Tosi, 2007, p. 123.

and dissection, the comparison of different similar manifestations and the extrapolation of values and constants.[95]
Before to introduce photography in his study, Marey invents a recording method based on the pneumatic impulses emitted by the sensors located under the clogs or on the limbs of a horse in movement. These signals are recorded on a rotating cylinder. With this method of graphic recording, he is able to trace demonstrative diagrams on the spatial and temporal relation of the horses' legs for each type of pace.

After publishing in 1873 the results of his research on the locomotion of horses based on the graphic method (*La machine animale*, 1873), Marey refines his experimentation through photography, which makes him very enthusiast about the results achieved by Muybridge. In order to advance on the study of physiological processes related to the movement, the graphic method and the verbal and written language are not sufficient. The interest of Marey is mainly expressed in the original method elaborated by Muybridge.
Willing to come into contact with the English photographer to arrange an eventual collaboration and to integrate different systems of analysis and research, he vainly attempts to establish an epistolary exchange[96] with him.

While Marey proposes the use of only one device to photographically record the movement of birds, Muybridge wants to further his recording method by means of a variety of recording devices and to this regard wishes to count on the collaboration of Marey. They meet on 26th September 1881 at Marey residence in Paris, ultimately confirming the impossibility of this collaboration. Thus, in 1882, modifying Janssen's revolver, Marey invents a personal device for recording: the *photographic gun*, which allows to record and reproduce human and animal movements with a remarkable accuracy.

> «I was able to realise, in the dimension of a hunting rifle, a device that photographs twelve times at second the aimed object; every image requires, as exposure time, only 1/720

[95] Tosi, 2007, p.122.

[96] December 1878 through the journal *La Nature*.

> of a second. The barrel of this rifle is a tube containing a photographic objective. Behind, solidly fixed to the barrel there is a large cylindrical breech where there is the clockwork mechanism. When you pull the trigger of the rifle, the mechanism is set on motion. A central axes, which makes twelve turns per second, controls all the other parts of the machine.» [97]

With the photographic gun, the graphic techniques used to record and study the locomotion of humans and animals are enforced by photography. The research technique of Marey, he himself names crono-photographic and which afterwards would be called photocronographic, it will simply be referred to as cronophotography.
As years go by, Marey sharps his recording tool and he employs it in different scientific experiments. In 1883 on the journal *La Nature*, he publishes the cronophotography of a running man, and in 1887 so much as eleven works he presents make use of the cronophotographic technique as a fundamental research instrument.

A decisive element that draws up the inventions to their application in the research, is the interest nourished by the French physiologist in the visualisation of the movement. The photographs are not only relevant for a single or comparative study. By the use of *Phenakistoscope* or of *Zootrope*, it is possible to reconstruct the movement just on the basis of the photos shot at very short intervals. Throughout the years Marey has become a specialist, a pioneer of this new way of seeing, communicating and understanding reality based on images rather than on words.[98] In this regard his contribution can be framed as the starting point of the popularisation that throughout the 20th century will know an incredible evolution.
The photographic gun is substituted few years later by the film *Cronophotograph* presented on 29th October 1888 at the Academy of Science in Paris. This new device allows to obtain a greater number of images, bigger and better defined, with rapid time intervals and exposures and suitable for any kind of experience. It is also possible to better regulate the focus (unlike the photographic gun) and the spatial-temporal parameters of each single shot are easy to record and use for a scientific reading of the images.

[97] *La Nature*, 2 April 1822, in Tosi, 2007, p. 134.
[98] Tosi, 2007, p. 153.

Through this new instrument, the French physiologist also elaborates a variety of innovative applications in different scientific fields. The introduction of the Cronophotograph solves the problems related to the overlap of the same image on the slab and it makes no longer necessary to photograph exclusively white objects on a black ground.
In 1890 Marey creates a new refined Cronophotograph: the film is now made with a transparent support of cellulose nitrate, the intermittence of movement is obtained by a mechanic system that prevents from tears, breaks, and unevenness in the film running, which has to move rapidly but at the same time has to stop several times for only one second in front of the shutter.[99]
The Cronophotograph is considered as the real link between the photographic devices and the first cameras.

In 1894 Marey conducts an experiment considered fundamental for the emergence of scientific cinema. Almost accidentally he records the fall of a cat to verify, as the popular wisdom claims, if a cat always falls on its four legs. Using the Cronophotograph for recording and the *Zootrope* for projecting, the short film realised by Marey represents the first record of a rapid dynamic phenomenon (possible to analyse naked-eye) on mobile film: this is one of the basic principle of the cinema of science, one of the historical reason of its origin, a discriminating feature that distinguishes it from the entertainment cinema.

As to demonstrate the variety of possibilities offered by the cronophotography, Marey takes a stab at experiments that lie outside his specific field of studies. He works on thermodynamic, inventing a visualisation technique of wave motions and stereoscopic recordings by means of a double objective chronograph, and he finally becomes keen in 'air navigation'. In 1899 he improves one version of his chronophotograph placing beside the by now noted instrument a microscope with an automatic illumination of the filming area only while the shutter is open. The

[99] Tosi, 2007.

lighting at intervals prevents the products analysed from overheating and therefore it helps the success of the experiments as well as the recording process.
To conclude, we can infer that Marey is the scientist who most, among the others, contributes to the birth of scientific popularisation by means of moving images. His researches and studies, carried out with passion and competence until the last years of his life, are important for two main reasons: first, they introduce a new way of making science; second, they inaugurate a new way to diffuseit. Paraphrasing the same Marey, it can be said that his achievements have helped to supplement the limited capacity of our senses to discover and analyse reality, and have expanded the formulas available to scientists by providing them with a new language.

2.2.4 Felix Louis Regnault

Besides these three precursors of scientific cinema, Felix Louis Regnault, one of Marey's student, makes use of moving images for anthropological documentation. French doctor combining his interests in anthropology, anatomy and medicine with an evolutionary vision of the human species, he uses Regnault Marey's photographic gun to make the first ethnographic film in history. This consists of a series of shots taken at the ethnographic exhibition of West Africa in Paris, depicting a Wolof woman while making pottery. In December 1885 Regnault makes public its production, that is the same month and year when the Lumière brothers present their cinematograph in Paris. In the course of the following two years, Regnault's engagement is to document the locomotive behaviour of black populations, focusing in particular on the study of trees climbing.
Regnault's work has then to be considered determinant in the process of scientific validation of the moving images. As the same inventor states:

> «The vision of the movement through the film is even better than the simple vision on live. The film allows to decompose the movement in several images that can be analysed separately. [...] The cinema expands our vision in time as the microscope does in space.» [100]

[100] Regnault cited in Rony, 1996, p. 47.

Even many years after the birth of the entertainment cinema, the research within the cinematographic field remains almost exclusively in the hands of scientists and experimenters.
The real origin of cinema is thus determined by the needs of scientific research, by the need (thanks to the extension of the technical potential) to record the physical reality in its dynamics in order to analyse, study, and discover; in order to know.[101]

2.2.5 Other Contributions

The works of Janssen, Muybridge, Marey, and Regnault, as well as anticipating the invention of Lumiére brothers, have to be regarded as the first real experiments on recording and divulging moving images for scientific purposes. In the same period, other scientists elaborate and refine techniques that bring a consistent contribution to research and to scientific popularisation. These supporting actors in the events that testify the birth of scientific cinema focus their attention on specific fields of study, often encouraged by commissioners interested in having a new version or a scientific prove of natural phenomena.

Ottomar Anschutz (Lissa, Prussia 1846 – Berlin, Germany 1907), son of a professional photographer, impressed by the photographs of Muybridge, which from the United States reach the small village of Lissa where he lives, he specialises on the shots of flying birds. His full-detailed and sharp images allow to clearly grasp the single phases and movements of birds in flight. In 1885 the Prussian Ministry of Culture allows him to build a recording device formed by twenty-four cameras electrically connected with each other. The mechanism, which closely resembles the technique developed by Muybridge few years earlier, consents the release of twenty-four photographs in a total time of 72/100 of second. As pointed out by Tosi[102], although it occurs several years after the thousands shots that Muybridge took for the University of Pennsylvania, it is important to remember the work of Anschutz for the technique he used and for the excellent

[101] Tosi, 2007.
[102] Tosi, 2007.

quality of his photographs. Although very small (the picture of a horse is indeed only 20-25 mm big), the excellent quality of the negatives is due to their capacity to bear even a thirty-time enlargement.
In 1886, the Ministry of War demands Anschutz to transfer his equipment to the horse-military institute in Hanover for recording the horses in movement for research and training purposes. The first photo of a bullet coming out from the barrel of a rifle was also taken by Anschutz for military purposes.
To animate his shots in 1887 Anschutz presents to the Ministry of Culture in Berlin a device he invented called *Elektro - Tachyskop*. Passing by a frosted glass (which constitutes a small screen), each photograph is illuminated by a strong spark produced by a Geissler tube for about 1 / 30 of a second, giving the viewer the illusion of movement. Compared to the previous *Zoopraxiscope* of Muybridge, it is interesting to note that since the beginning Anschutz uses photographic enlargements instead of coloured drawings derived from the photographs.[103]

Albert Londe (1858 – 1917), is a photographer and medical researcher. In 1883, at the Salpetriere hospital, he uses an apparatus with nine objectives arranged as crown and provided with electromagnetically controlled shutters of his invention to record sequences of images on the phases of hysteria and other nervous disorders.
His main results are essentially those of serial photography applied to medicine, but the interests of his work are wider. He is a technical expert on photography, he publishes various specialist works on film development, on snapshot, on photography applied to medicine and a treaty of a general nature, *La Photographie moderne*, which obtains more than one edition. Londe is a supporter and populariser of the ideas and theoretical principles already established by Marey; he particularly cares about the idea that the projection for scientific purposes serves mainly as a means of verification and that what is important for research is the chronophotographic analysis. He also stresses the importance of the slowed or

[103] Tosi, 2007.

accelerated projection, since it allows to study phenomena that are otherwise invisible.[104]

Georges Demeny (Douai, Hungary 1850 – France, 1917), is one of the main collaborators of Marey. Between 1890 - 1891 he publishes on the journal *La Nature* a series of articles on the physiology of locomotion illustrating them with chronophotographs. Later he specialised on the use of chronophotography shots to record the face of a person in the act of pronouncing words. The ultimate goal of the experiment is to manage to teach deaf and blind people the language through the chronopghotographic projection. These shots at close range, which allow to highlight the expressive and mimic details, anticipate the "close up", one of the main recording "frame" within the grammar of film shooting that will be developed few decades later. Once again, at the base of a series of technological developments that will later lead to the entertainment cinema, lay scientific, as didactic needs too.[105]

In 1891 Demeny adjusts a projecting system called *Phonoscope*, which incorporates some elements from the *Phenakistoscope* by Plateau, the *Tachiscope* by Anschutz and from the *Zoopraxiscope* by Muybridge. Since that time, the interest of Demeny moves from research and popular science, to the attempt to market the *Phonoscope* to a large public. He aims to spread the "living portrait", namely the possibility for the upper classes of being portrayed in the most important moments of life in order to maintain the audio-visual memory over time. The idea of a widespread distribution of the *Phonoscope*, casts Demeny into the vortex of business with weaker results than expected. The French researcher does not realise that his device has the disadvantage of showing the images in a continuous (not intermittent) way, returning them scarcely illuminated. For this reason in the same years his device is passed by the invention of Lumiére brothers and by the opportunities it inaugurates for the entertainment cinema. The idea of

[104] Tosi, 2007.

[105] Tosi, 2007.

the “living portrait" does not get the desired success, but the great contribute of Marey has to be acknowledged, first as assistant and then as researcher, on the filming methods for the deaf - mute people.

Lucien Bull (Dublin, 1876 – Paris, 1972), was an assistant and a colleague of Marey during the last years of his life. In 1894, during his work at Marey Institute, he conceives a device consisting of three separate elements (camera, microscope and a light source) and of a mechanism allowing automatically its activation to shoot a frame every fifteen minutes. The purpose of this tool is to identify in real time the evolution by budding of marine micro-organisms. Since this phenomenon takes place extremely slowly, in order to make it visible it is necessary to condense the real time. The shots, which during the projection are accelerated about fifteen times to allow the demonstration of the phenomenon, are defined *Biotachigraphies* and are the first important results achieved by the application of the alternate cinephotomicrography. In 1902 the same Bull, in the attempt to decipher the physiological mechanism of the rapid motion of the insects wings, realises a series of experimental shots at about 500 frames per second. From condensing time in the unfolding of a very slow event, Bull achieves to record ultra-rapid movements.
Over the years Bull proceeds with his research and sharps his recording techniques. The military environments attempt to involve him in the study of ballistics, but the British scientist wants to give his contribute through works that are peace or defence-oriented.
If for Marey the chronophotograpy is basically a method and a tool for his studies in physiology, for his student Bull the scientific cinema becomes an object of inquiry itself.[106] In addition to the ongoing elaboration of new devices and equipment for research, Bull’s activity is also aimed at the popularisation of his works, which became of great social importance.

Ernst Kohlrausch (Luxembourg, 1850 - Hanover, 1923), professor from Hanover, he teaches sports physiology. In 1891 he publishes the description of his taping

[106] Tosi, 2007.

device, by which he obtains serial images of sportive activities. The originality of the apparatus of his invention is represented by the efficacy of 24 small cameras mounted on a wheel of about one meter diameter. Rotating the gimmick, the series of single images is taped from a single point of view, preventing in this way the problems of parallax met by Muybridge and the overlaps of Marey's photographic method. Due to its weight and burden, the device of Kohlraush has no applications out of his experiments. Subsequently Kohlraush manufactures a wheel with only four cameras to record pathological forms of human locomotion. This physiologist has to be remembered for the contribution he gave to the popularisation rather than the invention of new taping devices.

The botanist **Wilhelm Pfeffer** (Grebenstein, 1845 - 1920), from the University of Leipzig, in 1900 publishes a work setting out the results of the researches on geotropism and the growth of some plants carried out through the cinema. Pfeffer is the first to use (second only to the almost accidental experience of Janssen) the technique of shooting at intervals to condense the real time and render visible and audible phenomena such as the birth and slow development of the vegetable world.[107]

2.2.6 The Kineto-Phonograph by Edison

Before to come to the chapter on the advent of cinema is important to mention another pioneer and inventor who through his work anticipates the development of cinema: **Thomas Edison** (Milan, Ohio, 1847 - West Orange, 1931). The American inventor, after being known for having improved the telephonic equipment, reaches an international fame in 1877 by patenting the phonograph, the first tool that allows to record and reproduce sound. While the recording of non-reproducible sounds had already been achieved by Leon Scot de Matinville (France, 1857), Edison is the first to build a device that puts into practice various theories circulating in the scientific circles of that time. His invention obtains such an unexpected effect that

[107] Tosi, 2007, p. 224.

for ordinary people it seems almost magical. After adjusting the phonograph, Edison tries to add to moving images the sound he had been able to reproduce. Paradoxically, respect to all the inventions introduced by the precursors of the cinema up to that time, this new device is uniquely meant to accompany the sound, the images are then of secondary importance.

In 1889 Edison is supported by an assistant, **William Kennedy Laurie Dickson** (1860 - 1935) who helps him to develop a new device suitable for his purpose. Dickinson, on the base of Muybridge's and Marey's work, creates a camera by which Edison experiments the use of film. Dickson cuts the Eastman Kodak film in tapes 35mm wide (1 inch), making four holes on the sides so that the gear wheels can make it scroll. In 1891, after several attempts, Edison presents the *Kineto-Phonograph*. It functions through the continuous scrolling of the film, which moves under the opening for viewing at a speed of 46 frames per second, passes in front of a light bulb fixed under the film and a rotating shutter. The synchronisation of the film with the shutter is ensured by the lateral perforation (inspired by the automatic perforated sheets of the telegraph), which is inserted into the machine provided with 'toothed' rolls. It is clear that Edison has introduced the mechanism of projection which would have been used by Lumière brothers for their cinematograph. The American inventor, however, is not interested in a projecting machine for the public, naively convinced that the future of motion pictures would have occurred through the use of personal projectors. For this reason he asks Dickinson to improve the Kinetograph for a personal use in laboratory. It is thus devised the Kinetoscope. Edison is not completely unaware of the potential of his machine and decides to commercialise his invention making a small repertoire of films (maximum duration of 20 seconds, since the length of the film contained in the Kinetoscope is limited) taping the performances of people from the entertainment world: athletes, acrobats and dancers. The shots take place at 'Black Maria' theatre in New Jersey (the first film studio in history), able to rotate on itself thanks to some tracks to capture always at best the sunlight. The first place with Kinetoscopes was opened on 4th April 1894 in New York. The machine is set in motion by inserting a nickel and turning a crank that allows the film to scroll; the

images are visible by a single person at time through a loop and most of the time they are synchronised with a musical accompaniment.[108]

The invention of the Kinetoscope is the last step before the birth of the cinematograph of Lumière brothers. The device of Edison is a further confirmation that all the inventions introduced by that time have not been designed for the simple reproduction of moving images but are meant to produce scientific research and integrate other inventions (as in the case of Edison). As well as promoting technical and scientific innovation, the ingenuity of Edison is expressed by his will to market and distribute his device. The technical and commercial legacy of the Kinetoscope is then welcomed by brothers Lumière, who foresee in the taping a great potential. With their invention the French brothers give rise to a phenomenon by which it would have rapidly developed an 'image-mediated language of reality', such as the documentary, as well as a narrative figurative art as the fiction cinema.

[108] In the cinematographic system of Lumière the idea of audio-synchronisation was put aside due to the impossibility of amplifying sound inside a room.

2.3 The Advent of Cinema

When, on 28th December 1895, Lumière brothers present in Paris the cinematograph,[109] it is clear that a new era is officially beginning. After all the experiments and all the instruments that until then had been invented, their device comes immediately to dominate as a unique and unifying element for the diffusion of moving images. The phenomenal reality can be reproduced with extraordinary precision. Actions and complex movements can be followed with no interruption. Besides generating the curiosity of the public, the cinema of Lumière brothers stimulates the enthusiasm of scientists from different disciplines. It is the 'realism' of representation, the naturalness and the 'truth' of the moving objects and characters, to constitute the charm and novelty of the show.[110]

Light, compact, suitable for both shooting and projecting, the cinematograph is refined by the chief mechanic of Lumière industries, Charles Maisson. It operates at 16 frames per second (cadence maintained until 1929) with a 35 mm celluloid perforated bandwidth, it guarantees a high degree of quality, thanks to the plates *etiquette bleue*, and a great handling. From a philosophical point of view, the improvement of Edison invention represents a sort of democratisation: the *Kinetoscope* was in fact a large wooden box reserved to a single spectator-voyeur at a time; with the cinematograph the projection becomes a collective enjoyment, a group event.

> «We all have seen and admired the Kinetoscope of Edison, but it still remained one step to do: that device allowed the synthesis of movement, but for only one spectator at time. It had to be refined permitting the audience of an entire room to enjoy its vision. This is what Lumière brothers achieved by the marvellous invention that they patented under the name of cinematograph. This device consents to project on a screen animated scenes that can last up to one minute.»[111]

[109] The cinema of that time was an extremely simple device, set in motion by a crank that allowed the running and the rewind of the cinematographic film, perforated and considerably long, so that the continuous recordings could last enough time to represent the actions. The device was able to project on a white screen a sequence of distinct images impressed on a film, creating the effect of movement.

[110] Rondolino, 2010.

[111] Chardere e Borgé, 1985, p. 105.

As it has be seen, although the precursors and the experimenters of scientific cinema had already anticipated the features of the cinematograph, the new invention gathers its principles and is oriented to an extension of the use of the moving images towards a form of spectacle. This is the key point, namely the discrepancy that occurs with the introduction of cinema and that leads to an initial distancing by scientists from this rising phenomenon. Engineers and scientists can not bear the idea that observations, inventions and studies may find their finalisation in a device used by street vendors and merchants in the suburb festivities. Despite festivities despite a difficult approach, the connections between scientific cinema and entertainment are inevitable. The use of this new method, practical and enforced by surprising results, comes to know an extensive application among scientists and experimenters, defeating, in few years, the skepticism expressed by the scientific environment.
Regnault was one of the first who foresaw the importance of the cinematographic tool in scientific disciplines:

> «Every museum of anthropology should be provided with apt cinematographic archives. The simple presence of a potter's wheel, of some weapons or of a primitive loom is not sufficient for a full understanding of their functional use; this can be transmitted to the posterity only by means of precise cinematographic recordings.» [112]

On 25th January 1896 an article appeared on *Le Monde Illustré* marks the definitive success of the cinematographer and underlines the importance of this new technique from a scientific perspective too:

> «A recent device gains the enthusiastic attention of the public: it is the Lumière cinematograph. Cinematograph is a Greek composed word that signifies recording of the movement. And what it is aimed to do by this tool is indeed to reproduce life, the movement in all its manifestations: the animation of the streets, the work of the labourer, the child who smiles, the passing bicycle, the cigarette between the lips, the hands on the hips. The goal has been achieved and the sciences will be able to make the most of the use of the cinematograph to record the subsequent phases of various phenomena. A larger diffusion of the cinematograph will finally allow to realise living portraits instead of those cold and affected

[112] Tosi, 2007, p. 214.

> images that never resemble the existences of which they would like to fix the still and fascinating appeal.»[113]

During the early diffusion of cinema, short films by Lumière brothers appeared alongside the films realised by Georges Méliès[114], making immediately evident the substantial gap between the two types of production. While Lumière films are limited to recording life without technical elaborations and scenic deformation, Méliès, through optical tricks, "oneiric dream" scenic expedients and distorting lenses, wants to create an illusion of reality. The ultimate aim of the Méliès work is to amaze and surprise the audience with a cinema that can become theatre. The contrast between Lumière and Méliès production is considered by historians to be at the base of two different cinematographic models: the documentary and the fiction.

> «Torn between village fairs and classy rooms, between spectacles on the stage and spectacles on the screen, between the still projection and the animated one, between the authentic documentary and the special effect, the cinematograph lays in its own way between documentary and fiction, and it is already an uneven battle.»[115]

2.3.1 The Production of Lumière

At dawn of the 20th century, Lumière brothers, after experimenting the dramatisation through micro - film stories that have become a symbol of the birth of cinema, as *The Sprinkled Sprinkler* (*L'arroseur arrosé*, 1895) and *Battle with snowballs* (*Bataille aux boules de neige*, 1896), have another important insight:

---

[113] *Le Monde Illustré*, 25 January 1896, cited in Chardere e Borgé, 1985, p. 105

[114] Maries-Georges-Jean Méliès (Paris, 8 December 1861 – Paris, 21 January 1938) was a French film director and illusionist. He is recognised as the second father of cinema (after brothers Lumière) for the introduction and experimentation of a large number of narrative and technique novelties. To him is attributed the invention of fiction cinema (capturing world "different " from reality) and of numerous cinematographic techniques, in particular the editing, the most peculiar feature of the rising cinematographic language. He is universally acknowledged as the 'father' of special effects. In 1896, he accidentally discovered the trick of substitution and was one of the first film director to use the multiple exposition, the fading and the colour (hand-painted directly on the film).

[115] Guy Gauthier, 2009, p. 58.

they decide to send operators around the world.[116] About fifty adventurers trained in the use of cinema, leave for the four corners of the planet. Their task is to project the new 'imaginative illusion' during fairs, sheds or temporary settlements and, during the pauses of the shows, to realise shots of people and places previously scarcely known at home. They use a light-weight, portable, reversible apparatus; with a few basic chemicals products and buckets of water they were able to develop their films as photographs.[117]
In addition to the performances played for common people, the envoys of Lumière meet also the public authorities: in April 1896 they are in Vienna by the Emperor Francis Joseph, in June in Madrid by the Spanish queen and in Belgrade by the king of Serbia.

In terms of popularisation, the value of the films by Lumière is represented by the possibility to cast a look at other cultures, hitherto unknown or only described through words. Showing habits, customs and traditions of distant populations, as well as representing a powerful fascinating inspiration, offers a significant broadening of the anthropological spectrum. Going through the titles published on Lumière production catalogues[118], it emerges that the majority of films (over two

[116] The countries where there has been documentation were: Algeria, Tunisia, Germany, England, Austro-Hungarian Empire, Italy (in the archive are kept the images of Genoa, Milan, Monza, Naples, Rome and Venice), Russia, Sweden, Switzerland, North America, Mexico, China, Japan. Among the operators we remember: Felix Mesguich, in the United States, in Canada and Russia, was extradited by the czarist empire for having dared filming Bella Otero while she was dancing with a Russian official. In 1908 he made the first aerial shot on board of the airplane of brothers Wright. Gabriel Veyre, from Lione, abandoned his study in pharmacy to travel around Mexico, China, Japan, Indochina and Morocco. To Alexandre Promio is attributed the first example of travelling for having placed in 1896 his film camera on a gondola in Venice. Charles Moisson, finally, was in San Pietroburgo on 14th May 1896 in occasion of the coronation of the Zar Nicola II when a balustrade caved in, spreading panic among a crowd of half a million people; the police charged at the people who approached the imperial stage and the operators triggered the crank. The film was confiscated, they were arrested and nobody saw the five thousand corpses filmed in what was an example of a new way of making information.

[117] Chardere e Borgé, 1985.

[118] Between 1895 and 1907 the Lumière catalogue archives 1424 footages divided in 'genres': 337 'scènes de genre', 247 'voyages à l'etranger', 175 'voyages en France', 181 publish celebrations, 125 French military views, 97 "film comiques", 61 maritime scenes, 55 foreign military views, 46 dances and 37 popular festivals.

thousand in ten years) are attributable to works nowadays categorised as topical newsreels or documentaries. European capitals, cities and sites of America, Asia, Africa, Australia, as well as contemporary events such as royal or presidential visits, diplomatic travels and openings: the main goal of the cinema of Lumière is to provide information.

> "Following the guidelines and the example of Louise Lumière, his operators have simply put the bases of something that is not yet means of expression, nor an art, but that is surely reason of attraction: simplicity, balance, return to the real. And to Lumière will be always recognised a substantial realism, free from stylistic embellishments and attempts to create distance, the capacity of rendering the candour of the thing that has been seen and exposed to the eye, which, in the silence, is intensely listening to." [119]

The gradual improvement of the formal dimension also represents a direct consequence of the principles that animate the documentary productions of Lumière. The first camera movements, such as tracking shots and pans, are an attempt by operators to record moving events or to contain in a single frame as much details as possible.
For these reasons it can be said that Lumière, with the curiosity proper of investigators, sense what in the years to come would have represented the two contrasting souls of cinema: that of fiction (which Méliès develops immediately) and the documentary one.

> «Louis Lumière was an innovator, but the Société Lumière was an industrial enterprise in full development. It was thanks to it that it has been possible to assure this invention all the expansion it deserved, without having to previously convince someone to take charge of it. Louis has been then a great operator and the first cinematographic director. And since he disposed of agencies corresponding abroad, he could diffuse his invention everywhere, export and exploit his films, impose the cinema in the world. [...] But Louis Lumière made use of his device to see, not to express himself and the cinema would soon have been dominated by the personality of Georges Mèliès. »[120]

[119] Chardere and Borgé, 1985, p. 113.
[120] Chardere and Borgé, 1985, p. 119.

2.3.2 Georges Méliès

Georges Méliès, universally recognised as the father of cinematographic fiction, man of theatre and illusionist, he uses cinema mainly as a means of "ironic mystification" of reality. In opposition to Lumière, Méliès does not orient the lens toward the external world, but forces them to capture the images recreated in the set. His films[121], entirely made in the studio, are the manifestation of the desire not to leave anything to chance and therefore they distinguish themselves and can be considered the antithesis of the documentaries by Lumière.
In 1896, after receiving the rejection by Louis Lumière to use the cinematograph, Méliès struggles to find a similar device that would permit him to make those shows that at first would have served to enrich his plays and later to replace them. In this regard, it is important to underline that it is not possible to clearly separate the theatrical involvement of Méliès from his cinematographic production, since the latter represents the essential condition and the consequent extension of the first.[122] His style indeed is not properly cinematographic, rather theatrical: structure of the story, frames and narration in his films are developed according to scenic elements, with no real dynamic representation. If Lumière limited themselves to record life as it occurred on the field, Méliès records theatrical shows already packaged.

The new 'cinematographic tools' represent the success of the French film-maker. Méliès uses the editing not only as the juxtaposition of scenes shot in sequence but also as a means for the elaboration of meaning. He experiments innovative filming techniques through the use of models and images recorded through an aquarium that produces strange effects. Méliès lays the foundation for the future language of film, introducing to cinema the constitutive elements of the theatrical apparatus:

[121] Among the most renowned films we remember: *Le voyage dans la lune* (A Trip to the Moon 1902), a comedy film of fantasy about a group of scientists aboard a space shuttle in orbit to the Moon, escaping after being taken prisoners by some strange creatures; *Le Voyage à travers l'impossible (The Impossible Voyage, 1904)* adaptation for the screen of a theatrical pièce set up in 1882 at the Théâtre de la Gaîté. *Voyage à travers l'impossible* is realised following the logic of a dream. Méliès neglects the verisimilitude and the cause-effect relation. The film skips from meteoric episodes to contemplative interludes, ignoring the rationality and the laws of statistics with the casual freedom of a child.
[122] Rondolino, 2010, p. 29.

actors, scripts, costumes, make-up and scenography and collocating the camera at the bottom of the studio, as a spectator sitting on his chair. His aesthetic can be defined as a 'movie theatre' allowing him to shoot great masterpieces, to create his own fantasy, wonderful, poetic and fascinating world, on the border between science and magic.

> «Only the future will be able to establish who, between Louis Lumière and Méliès played the most incisive role in the development of cinema. The one and the other have opened one door, but without crossing the threshold. Louis Lumière, refusing to accredit to the objective other function but the one of a recording eye; Georges Mèliès being not able to see in the absolute of the film camera nothing else except the completion of the illusion.»[123]

To be correct the exploration of the work of Méliès cannot be limited to a mere reverie or to his illusionist and theatrical creations.
Together with his works of fantasy he offers, especially at the beginning of his production, 'reconstructed actualities', attempting to offer objective information on what, due to a rudimentary technology, he is not able to record from real. This is a limited production, which does not put into question his contribution to the birth of fiction cinema, which is accurately constructed to the finest detail, leaving nothing to chance.
It is important to compare two modes of making cinema that since its invention develop parallel, the one of Lumière brothers and the one of Méliès. This combination consents to highlight the substantial differences between these two "models" and to establish the unique characteristics of the documentary genre and of the fiction, which during the 20th century will develop independently their own codes, languages and grammars.

[123] Chardere and Borgé, 1985, p. 120.

2.4 The Evolution of Scientific Cinema

After the introduction of the 'cinematographic system' by Lumière brothers, which in few years wiped out other attempts and recording and projection prototypes, in the first decade of the 20th century the cinema begins to adopt specific rules and codes, as well as a production chain. The film-show experiences a profound transformation both for producers and film-makers, both for an audience that is becoming increasingly numerous and attentive to the images that are projected, starting to elaborate a critical conscience. From the French production of Charles Pathé[124], the first important cinematographic entrepreneur who grasps that cinema can represent a business and films its products, the *seventh art* begins to grow in many other European countries, besides the United States.

The rapid technological and social development of the 'cinematographic phenomenon' embraces also the scientific genre, which grows fast refining and calibrating with increasingly depth the range of the films. On the wake of the initial experiments, the cinematographic technique is used to make short films on medicine, botany, physiology and mathematics: not solely for purposes concerning

[124] Charles Pathé (Chevry-Cossigny, France, 1863 – Montecarlo, 1957). He was the promoter of the the first French cinematographic industrial system, focused on the concept of film as a real product. The films had to be thought and studied previously and no longer left to improvisation, as it was by the Lumière. The products of the Pathé industry had to be prepared and diversified according to the public tastes, satisfying the naïve spectator, the educated and the sophisticated one. He then created one of the first cinematographic studio and centred his production on a patent sense of pathetic, he distinguished it per genres and took special care for the quality of his products. In this he was supported by a great collaborator, Ferdinand Zecca, to whom he committed the production, the realisation and the supervision of his products as well as the training of his technicians. Zecca became therefore the ace up the sleeve of Pathé, and realised with particular skill comical scenes and dramatic-realistic ones too. Among them: *Historie d'un crime*, 1902; *La Passion*, 1900, etc. From 1903 to 1909 Pathé managed to transform a still handmade product into a large industry and realised colossal profits, opening agencies in every corner of the world. After 1906 he produced films longer than three hundred metres and with rather intricate plots. Finally, in 1907, the Pathé ceased the direct sales of its films, granting the exclusive to five societies that controlled a great part of Europe and North Africa: production and renting assumed since then the role they would have hold and developed later on. Pathé found then in the Gaumont a competing distributor to be afraid of especially as concern films with artistic pretensions: nevertheless his domain on the market lasted long. in 1929 Pathé decided to retreat and granted the direction of his distribution to Emile Natan.

the community of scholars. Technicians, researchers and scientists, specialise in their areas of interest developing shooting systems that allow the recording of phenomena in a clear way, making them suitable for further researches. Moreover in this period many scientists begin to show the footage of their experiments outside the scientific communities, fostering the popularisation that is revealing to be a vital presence in society.

> «Even after the hegemonic establishment of the fiction cinema, the scientific cinema has continued to represent an inestimable contribute to the technological and scientific progress of our century, in the more diverse fields and with the more disparate applications. Some of the characteristic expressions of scientific cinema have so deeply entered our daily life that they are no longer perceived as such. For example the reality show. The language of scientific cinema is not only a phenomenological reproduction of reality but it has become means of mass scientific communication.»[125]

It is important to underline that all the first films were somehow bound to a didactic intent or at least to the transmission of that facts and occurrences in a direct way, with no room for spectacularising interventions. In this sense, the distinction proposed by Tosi in his book *How to make scientific audio-visual* has to be taken into account to distinguish two different modes of making scientific films. If on one hand there are footages in which the subjects are presented according to their different aspects by rational and logic correlations, on the other hand there are films that to attract the spectators use expressive forms and a cinematographic language devoted to spectacularisation and emotional impression.

2.4.1 The Bird of Visual Anthropology

Visual anthropology is inaugurated by **Alfred Cort Haddon**[126] (London, 1855 - Cambridge, 1940), who carries out the first real scientific cinematographic shots on

[125] Tosi, 2007, p. 251.

[126] Alfred Cort Haddon was an important French ethnologist. Professor of ethnology in the universities of Dublin and Cambridge. He organised and directed (1898) the ethnological expedition to the Torres Islands and along the southern coasts of New Guinea, collecting important materials on the local populations. Among his

the field. In 1898 Haddon, assisted by Charles George Seligman and William Halse, organises and directs a wide ethnological expedition to the Straits Torres Islands and along the southern coast of New Guinea, where he collects consistent material on the local population. This production is recognised in the history of anthropological studies as 'the first attempt to study a population and its environment from a multidisciplinary point of view'.[127] The initiative of this work is due to Haddon himself, who intends to systematically detect all the data concerning the living populations in that area, from social organisation to religion, from daily life to material culture and technology. The Torres expedition establishes then the official birth of visual anthropology as a method of collecting data through the systematic use of the audio-visual recording tools in the field research.

Also with regard to the pioneering role of cinema in the documentation and ethnographic research, to the ritual dances shot by Haddon and preserved in some Australian film libraries, need to be added the many films of **Baldwin Spencer**, who in 1901 and in 1912 takes part to two expeditions among the Australians Aboriginals. Some of his films record dances that the native Australians still consider sacred and secret, causing the opposition to their diffusion.[128]

Another significant contribution to the development of scientific cinematography in the ethnographic field is the one brought by the Austrian **Rudolf Poch** (Tarnów 1870 - Innsbruck 1921), who from 1901 to 1904 carries out a study in Melanesia and Australia, producing abundant scientific materials for the *Naturhistorisches Museum* in Vienna. Between 1907-09 he studies the Bushmen in southern Africa. Poch is a strong supporter of audiovisual techniques and he integrates field observations with the photographic, cinematographic and phonographic documentation.
His 'sounded' film *Buschmann (Kalahari) spricht in den Phonographen* (1908)

main publications: *The study of man* (1898); *Magic and fetishism* (1906); *The races of man and their distribution* (1909); *A history of anthropology* (1910); *Migrations of cultures in British New Guinea* (1920).

[127] Fabietti, 2001, p. 90.

[128] Tosi, 2007.

shows a close-up on a Bushman talking and gesturing while keeping his mouth near the phonograph funnel. It can be said that this is the first successful attempt to record an audiovisual document of scientific value in the ethnographic field.

2.4.2 The Surgery Cinematography

Alejandro Posadas (Buenos Aires, 1870 - Paris, 1902), Argentinian internationally renowned physicist, realises one of the first scientific documentary of worldwide cinematography. In 1900 he manages to make Eugenio Py (Argentine operator) shooting two surgeries (hernia and lung hydatid cysts), declared by the *Argentian Film Archive* the first audio-visual records of surgical operations. The films, lasting three and a half minutes each, are used by the same Posadas during congresses, seminars and conferences held in Europe too. The projections of the surgery can help to explain precisely and with method the techniques used.
These two films are important because for the first time they allow the transmission of scientific and technical contents (the manual skill of the operation in real time) beyond the narrow circle of those who can personally attend to the operations of Posadas. They represent therefore real examples of popularisation and still today they constitute a significant document for the history of surgery and anaesthesiology.
From a technical perspective, Posadas introduces the alternation of two shooting spots: an all-comprehensive one for the contextualisation of the environment and a close one for the salient part of the operation. These are the first steps towards a cinematographic grammar that has still to establish its precise rules.

Eugèene – Louis Doyen (Remis, France, 1859 – Remis, 1916), internationally renowned surgeon, decides to start shooting his operations and to project them out of the hospital. In July 1898, after having met several impediments and ostracism at home, he participates at the meeting of the *British Medical Society* in Edinburgh projecting three films (including a craniectomy and a hysterectomy) to demonstrate the usefulness of cinema in the teaching of surgery and operation techniques. The projection was extremely successful and was repeated the following day. The

clamour gained by the projections arrived also in France, where in 1899 Doyen is invited to the French congress of surgery. Although he is a founding member of the committee, many of his colleagues oppose the projection because they see it as a public demonstration of bad taste. Doyen is then compelled to show his films outside the congress hall, gaining in spite of that the favour of the participants.

> «In contrast with what his polemic detractors claimed, doctor Doyen was not trying, presenting his films, to make a promotion extraneous to the professional ethics, although his figure of doctor does not seem to be particularly orthodox. He wanted to intervene through the cinema in the reform and renewal in teaching and in the surgery practice with his real operations that he called "surgery of the dead", that is the operating medicine of amphitheatre.»[129]

In order to realise his films, Doyen modifies the recording and projecting apparatus of Lumière brothers. Their films last only few minutes, but a surgical operation, to be recorded integrally, needs more minutes of film. The first difficulty is easily overcome by preparing longer reels and larger devices to contain them. The second problem concerns the need to dispose of particularly sensitive films: the surgeon refused to increase the illumination inside the operating room and its lights were not sufficient to impress the film firmly. After several attempts and experiments, Doyen manages to improve the objectives rendering them much more sensitive. Prompted by scientific urgencies, also in this case an evolution in the cinematographic technique has been achieved.

The French pioneer of surgical cinematography commits himself to introduce his films to other countries and in the circuits of cinemas. This fact arises the discontent of doctors and of public opinion itself, which that claim the intervention of police to ban the projections.[130] In spite of that, Doyen keeps encouraging also non-surgeons to watch his films. He wants all social classes to be able to realise what a well-conducted operation means.[131] Moreover, Doyen himself highlights an

[129] Tosi, 2007, p. 218.

[130] 'It seems that in Rome one of the first cinematograph opened by the photograph Felicetti was forced to close after having projected some of these surgery films.' (Tosi, 2007, p. 219).

[131] Tosi, 2007.

important aspect of the surgery filming, which refers to the possibility to improve his technique:

> «When I saw for the first time one of mine operation displayed on the cinematographic screen I have realised that I did not even know myself...The cinematograph allowed me to considerably refine my operating technique.»[132]

2.4.3 The Rontgenfilm

John MacIntyre (Glasgow 1857 – Glasgow 1928), in 1897 introduces the Röntgenfilm, experimental recordings of X-rays. Protecting the camera with sheets of lead and allowing only one small opening protected by black paper, this type of recording allows to impress the rays on the film. The technique is then developed at *Marey Institute*[133], where in the early 1900's **Dr. Joachim - Leon Carvallo** (1869 - 1936) builds a device that uses directly an experimental negative film[134] for recording the X-rays. This particular camera, electrically automated, shoots at a variable speed ranging from 30 frames per second and 1 frame every 15 seconds. Between 1903 and 1906 Carvallo realises several shots on swallowing and digestion in a variety of small animals, arriving to record up to five images a second. Its scientific and technical effort demonstrates as Marey Institute, even after the death of its founder, has not only maintained an engineering leap but also become a centre of scientific cinematography studying and experimenting its possible applications.

Röntgenfilm represents a branch of the scientific cinema to which other scientists and researchers after MacIntyre and Carvallo try to draw on to develop their

[132] Tosi, 2007, p. 218.

[133] At the international congress of physiology, gathered at Cambridge in 1898, it was decided to unify and render compatible the methods of physiologic research. To Marey was entrusted this working group. In the following years it will be decided to create an international association for the control of the instruments, and as acknowledgment of the importance of the researches of Marey this organisation will be entitled Marey Institute, establishing its centre at the Station Physiologique du Parc de Princes.

[134] The film was emulsified from both sides of the support in order to intensify the image, and its seize was larger than usual (60 mm). The film was realised by the Lumière company.

research. Despite the low intensity of X-radiation obtained at that time and the limited sensitivity of films available, recording experiments are carried out for diagnostic or physiological research on humans. The Dutch **P.H. Eijkman**, in the early 20th century, studies the human swallowing and in order to achieve a clear shot, with images sufficiently impressed to show the event, he forces the "patient - actor" to repeat over fifty times the action. Around 1910 the German **Franz M. Groedel** creates some devices consenting, through a heavy precision machine, to record on a series of plates 24x30 cm. Also the American **L.G. Cole**, at the end of 1910, records direct Röntgenfilm of gastric phenomena. Since he does not obtain clear images, he redesigns them one by one and photographs them on a 35mm film.
One way to overcome the difficulties of X-rays shooting was to film the normal fluorescent screen on which the rays projected the image under analysis. This method, defined indirect, presented at times problems of definition and lightening.[135]

2.4.4 The Micro-Cinematography

In 1908 the biologist **Jean Comandon** (Jarnac – Charente, 1877- Serves, 1970), officially invents the micro-cinematography. Comandon uses film recording for ethological and botanic purposes. By cameras integrated with microscopes, he records the movement of animal cells and the growing process of vegetable organisms. His most famous shot is from 1909 and shows for the first time the battery of syphilis, founded out in 1905. In the same year, with the support of Charles Pathé, Comandon creates a laboratory of micro-cinematography in the studio of Pathé in France. From 1909 to 1914 the collaboration between Comandon and Pathé consents to realise many important shots on cellular micro-organisms.
Later Comandon realises hygienic-educational films on behalf of the central committee for the assistance to elder soldiers with tuberculosis.
Between 1818 and 1926 he collaborates with Réginer (his operating assistant) and produces 369 educational scientific films.

[135] Tosi, 2007.

2.4.5 Between Cinema of Science and Documentary

Roberto Omegna (Turin, 1876 – Turin, 19 November 1948) was an Italian film-maker and documentarist considered by the experts the pioneer of scientific cinema. Fascinated by the recent invention of brothers Lumière, in the early 20th century opens in Turin, with his friend Domenico Cazzulino, the Edison Cinema. After purchasing a filming camera in Paris, he realises the images of a motor race that would become *The first motor race Susa-Moncenisio* (1904).
Omegna's production is later enriched by a variety of ethnographic films, which he realises during his travels throughout Italy and abroad. They represent real journalistic shots witness significant historical events as the tragic outcome of the earthquake in Messina (1908).
Subsequently, the film-maker from Turin focuses on the production of recordings with entomologic subjects. In 1908 he shoots a short film titled *Neuropathology*, by which Professor Camillo Negro from the university of Turin wants to demonstrate his students the behaviour of a woman effected by hysteria.

> «Professor Negro wanted, with a genial intuition, to apply the cinematograph to the teaching of neuropathy diseases, to offer the students of small universities where the "live" clinical material is scarce, a range of "types" and cinematographic cases. The successful attempt of Prof. Negro will not be spared from the rumours raised in the scientific world, for it clearly highlights and preserves the writing of the "movements" that the sole photography could not reproduce.» [136]

In this work, which is part of a series of 24 films, though demonstrating the limits due to inexperience and a still rudimentary device, it is possible to detect the first features of that cinematographic language the pioneers of fiction cinema would have increasingly refined in the following years. In spite of the linguistic-technical contribute, the analysis of this fragment, demonstrates the limits of a documentary where the boundary line between reality and fiction is not that clear.

> «We are in the undertow of a slippery documentary idea, that is demanded to be candid but that at the opposite reveals to be opaque resistance. [...] At the end of the treatment - in

[136] *Gazzetta del Popolo*, Turin, 18 February 1908. (Tosi, 2007, p. 237).

> which the woman is immobilised and repeatedly slammed down the bed - the eye of a camera shed by Camillo Negro reassures us on the exits of a science that has something miraculous (and of a cinematography that still appears too close to the scenic tables of Méliès). An institutional certification: once acknowledged its scientific attribute, the 'real' cinema extends its authority towards positivist mythologies and confirms the truths strongly caressed by the authorities yearning certainties.»[137]

In 1911 Omegna wins the world-wide cinematographic competition of Turin at the presence of Louis Lumière with the film *The life of butterflies*, which testifies the passage from a scientific-oriented production to the experimentation of the poetic and narrative potentialities of the documentary cinema. Anticipating the *stop-motion* technique,[138] still at an experimental phase, the film illustrates the stages of transformation of the caterpillar to a butterfly.

With the same purpose of offering an aid to the teaching, the German **Ludwig Munch**, high school teacher, dabbles in creating dozens of short films. By using drawings on paper, he realises about fifty shooting on mathematics. The technique he uses consists of scrolling the sheets in front of the camera to show the scientific concepts (twenty thousands of these drawings are kept at the *Deutsche Film Museum* in Frankfurt). Munch is the first to illustrate the geometrical laws through cinema and to use this tool in his teaching. 'Small videos on paper' are made out of his drawings to be used as didactic additions.

The beginning of the maturity of science film takes place around the twenties. In Italy, the ferment in the documentary production plays a key role in popularising science. In 1924, in the presence of Benito Mussolini in Naples, are shown some of the most important and successful films of Roberto Omegna: *The Life of*

---

[137] Bertozzi, 2008, p. 50.

[138] The stop-motion or the frame by frame shooting is a cinematographic and animation filming technique. The expression stop-motion refers both to the technique employed and to the product obtained by it. This term refers to the choice of the frames per second: if the frames are all different from each other, it has to do with the stop-motion. Nowadays the stop-motion uses a particular move camera that impresses one frame at time, set in motion by the operator/animator. By this process is then possible to animate cartoons, filming composition of glossy sheets; or to realise a step-one shooting, focusing the attention on the puppets (fixed, adjustable, made of plasticine, etc.).

Butterflies, *The Praying Mantis*, *The Blood Circulation*. This projection is decisive because it convinces the authorities of the regime to build the *Educational Film Union* (LUCE), which would later become the National Institute *Luce*.

Since the thirties the link between science and cinematography is fostered and reinforces its possibilities. In all the directions overtaken, the maturation of the cinematograph has seen a constant connection with science, on a technical level as from the point of view of topics and narratives.
The ensemble of the scientists considered so far, masterfully explored in the book of Virgilio Tosi,[139] has used cinematographic applications for documentation, analysis, demonstration and teaching. Those who worked in this particular and innovative research system can be divided into two groups: the pioneers of scientific cinema in their own field of study, and those who became so passionate of the language by images that became actual scientific film-makers.

The branch that parallel develops to the scientific cinema, but which can be considered an important contribute to the audio-visual attempt of informing for different scientific disciplines, is the documentary cinema. As we have seen, since the first Lumière productions, this genre proposes itself as the most faithful expression of reality. In the anthropological, ethnographic and sociological field, its contribute is of great importance. From the very beginning of the 20th century, the documentary becomes to all the effects, with its codes and languages, an autonomous genre, separating itself from the fiction cinema and representing, thanks to its poliedrical character, a valid tool in the hands of scientific popularisers.
In the next chapter, I will analyse the way popularisation can make use of different forms of documentary in the audio-visual panorama. Each typology is built on a specific language and can be used for divulging science on the base of their poetics and realisation style.

[139] Tosi, 2007.

2.5 The Documentary Cinema and its Forms

Since the official birth of cinema in 1895, the historic collusion between documentary of Lumière brothers and fiction of Georges Méliès has offered a double folded interpretative path every film-makers has at disposal.
Language, grammar, tools and operating modalities, have been characterising from the initial cinematographic production two different ways of "making cinema". If on one hand the model of fiction cinema of Méliès is connoted by a tension towards the spectacular, with a working system that has developed over the first decades of the 20th century,[140] the documentary, introduced by Lumière brothers through their travel reports, gave the first impulse for a tortuous and multiform path, where, over the years, the possibilities and the forms of production have extensively flourished.
Nowadays it is hard to find a unique definition for a multi-faced and variegated genre as the documentary, which counts, among its forms, the production of clearly scientific-oriented films. The essential identity of the documentary remains a matter of rare theoretical pregnancy; through stylistic assignations, attempts of interpreting the poetic and personal ideas, experts and film-makers have exerted an effective definitional power.[141]
In spite of the multiplicity of the documentary idea, it can be certainly said that this branch finds its (collocation within the audio-visual panorama, between the fiction cinema and the row shots (realised without screenplay, with no stylistic depth and refining in the editing phase) that belong to the most of scientific cinema hitherto analysed.

The documentary is not a fiction film because it is not based on fantastical tales or romanticised historical events, and it does not use professional actors to interpret the characters. At the same time, the documentary cannot be an objective reproduction as the scientific cinema, since it involves a series of procedures and

[140] Once more we can not dispense from mentioning the figure of Charles Pathé, who contributed to the world-wide commercialisation of films. The cinema system offered a production chain within which were formed professional specialised figures (screenwriters, editors, operators, set designers, etc.).
[141] Rondolino, 2010, p.16.

constructions (the choice of the frame, the editing, the inserts, the graphic and at times the screenplay) that constitute a filter between the spectator and the real life.
In my analysis I have chosen as a departure point the classifying model proposed by Giannarelli and Savorelli[142], who direct seven forms of documentary, distinguished according to the style connected to the technical and productive process (shots, data collection, post-production elaboration, distribution). These seven forms, representative of the entire documentary scenario, are:

- Contemporary or historical reconstruction documentaries
- Documentation of events without possibility of intervention
- Survey and reportage documentaries
- Interview and testimonial documentaries
- Totally or partially archive-based documentaries
- Film – essay and metalinguistic documentaries
- Experimental and advanced-guard films

For each of these typologies I have indicated the directors and the referential works that concretely outline style and technique of the presented forms. Once traced the review on the formal perspective, I have individuated the possibilities of popularisation within it, aware that the displayed documentary can already represent itself a form of popularisation, or material to be newly used for another divulging audio-visual.

2.5.1 Contemporary or Historical Reconstruction Documentaries

In this kind of documentary the shots are realised in real environments. The "linguistic practice" of reconstruction is not only related to the characters but involves the setting too (as for theatre where the whole scenography is artificial). This kind of reconstruction, one of the most common in the documentary, can be historical, if the reconstructed events belong to the past; or "contemporary" when facts, situations, characters, do exist and they occur in the very moment in which

[142] A. Giannarelli, S. Savorelli, 2007.

they are recorded. An emblematic example of this latter is *Nanook of the North: A Story of Life and Love in the Actual Arctic* (USA, 1922) by Robert Flaherty.[143]

> «To talk about Robert J. Flaherty means to deal with a myth and with all the contradictions a myth brings along. A myth. Thereby a symbol: because today as yesterday, it is sufficient to pronounce his name in order to evoke, among all those who deal with non-fictional cinema, the icon, not always totally reliable, of the film-maker par excellence.»[144]

In 1920, after a first failed attempt between 1913 and 1916,[145] Flaherty decides to tell from the "inside" the life of Eskimos, who should have been wittingly collaborating for the realisation of the documentary. For this reason, after purchasing all the necessary equipment to resist the intense cold (included a

[143] Robert Flaherty (USA, 1884 – USA, 1951). Left the mining school in his home country, in his early twenties he begins to beat the wild lands of Canada as explorer and hunter, animated by adventurous spirit and attracted by the fascination of untouched places. In 1913, during his travels in the Far North, he takes with him a move camera and during one of his fourth expedition in the Hudson Bay conducted on behalf of sir William Mackenzie, starts to shoot his first "amateur" film, feeling the need to capture those wild and majestic scenerios. His first "professional" film, the one that draws the attention of Hollywood, is a work on commission by a French company dealing in pelts, the Révillon Frères. Flaherty spends two year for shooting *Nanook of the North* (1922) among the natives from Alaska, making an elegy, a ballad on the life of a people living in symbiosis with an unkind nature. The success of *Nanook* brings to the not yet famous film-maker a second commission, this time by Paramount, for a film set in Polynesia, *The Last Eden* (1926). Flaherty cares also for the screenplay and photography, as he will do most of the times, starting from his next film, *White Shadows of the South Seas* (1928), which was left, however, in the hands of W.S. Van Dyke due to some contrasts with the production. The same fate touches the beautiful *Taboo* (1931), shot with F.W. Murnau, and suspended. He leaves then the Unites States to go to England to work with J. Grierson, leader of the great British documentary school. With him he shoots *Industrial Britain* (1934) and soon after he realises what it is considered his master piece, *Man of Aran* (1934), which he produces by his own, writing it, directing it and curating the photography. A painful film on the struggle for existence of a family of fishermen on Aran Island, a documentary that explores the life of men grappling with a though habitat. Back to the States, he writes *My Friend Benito*, one of the episodes of *It's All True* - (1942) that O. Welles shoots in Mexico. *Louisiana Story* (1948), his last great work, expresses the crude beauty of Louisiana wetlands, depicting the hard life of its inhabitants.

[144] Pinelli, 2008, p. 61.

[145] During one expedition on the Eastern coasts of the Hudson Bay in Northern Canada, Flaherty, sent there as explorer, between 1913 and 1916 shot about 20.000 metres of film that portrayed the Eskimos he met along his path and their way of life. Unfortunately, while he was preparing the negatives to send them to New York, a cigarette butt fell into the box burning the material of which only a defective first copy of his work could be saved.

portable projector to show his "actors" the work), he ventures (in) this challenge. Flaherty spends an entire year living with the Eskimo population and achieves meeting the collaboration of the same people he tapes. The full-length film that originates from this experience, 60 minutes long, focuses on a great hunter Nanook, and on his family.

> «Men understood, for example, that when the friend Robert asked them to show him a hunt of seals, he did not do that to assure himself a good dinner, rather because of his interest in this animal, in its skills an intelligence. This increased enormously the qualitative level of the participation of the protagonists in the realization of the documentary and transformed the shooting into an extraordinary example of ethnological value.»[146]

The narrative style used by Flaherty does not live space for emotional drifts nor simplistic escapes into irrational. His work does not charge situations taken from reality with empty aestheticisms. Still today his images appear realistic in showing the simplicity of an archaic society of men and women living in extreme conditions. If interpreted by an anthropological eye, these films represent an attempt to depict the 'otherness', where the main interest does not concern the vast community or the religious believes of the group, but it is focused in the inner dynamics of a single family.

It is important to remember the contribution of Flaherty, not only for having been the first who officially inaugurated the documentary cinema, but also because looking at his work we can consider to which extent his style contributed to the popularisation. From the point of view of truthfulness, we can doubtlessly state that in spite of his attempt to portrait the Eskimos in the spontaneous flowing of their daily life, the intervention of Flaherty is not invisible. Most of the shots are 'acted' (often under payment) by the locals, who looked towards the cameras during their routinised activities.[147] From the reconstruction of the igloo, to the selling of the

[146] Pinelli, 2008, p. 64.

[147] Furthermore it has to be remembered the scenographic interventions of Flaherty, among which the construction of an igloo of large dimension that was afterwards cut to allow the required illumination to film the interior.

pelts, up to the seals hunting, the film tale is stiff within small didactic frames that separate the spectator from the perception of realism.

> «At the base of the reconstruction of events, stands the awareness of the film-maker, who wants to tell from the inside, not by an external eye, the hard life of these populations. It is part of this attitude the choice of making the Eskimos hunting with their traditional weapons rather than with rifles, for Flaherty wanted to underline the difficulties of surviving among the Eskimos and to render explicit their conflict with the natural environment.»[148]

In any case, for the use of the documentary grammar itself, the style of Flaherty, beyond the limits above described, represents the matrix of an audio-visual communication that can be properly used also in the scientific field.
In relation to the reconstruction-documentary, from a stylistic point of view this typology can be certainly used to convey knowledge related to anthropological, sociological and ethnographic disciplines. This style assumes alternatively different titles, showing, as regards the content, to which discipline it refers: sociological, scientific, didactic film, etc.

The second model of reconstruction-documentary is the one concerning historical events. The common element is in this case the recourse to reconstructed places, attempting to recreate environments historically coherent with the displayed epoch.[149] An example is given by the war documentaries telling histories of resistance or epic battle.
From the point of view of popularisation, the historic reconstruction-documentary allows to explain facts contextualising them with accuracy and stimulating the identification of the spectators.
Knowing the context in which the facts occurred, the audience can better understand the dynamics at stake and the motivating factors. Beyond the classical documentary devoted to the transmission of historical knowledge, this typology can also be used to tell, contextualising them, findings and scientific revolutions. The risk in this case (here the screenplay plays a significant role) is to fall into a 'romanticisation' of history in order to keep high the attention. The content risks to

[148] Giannarelli, Savorelli, 2007, p. 37.
[149] Giannarelli, Savorelli, 2007.

unravel into a multitude of narrative expedients that embellish the narration at the cost of undermining the scientific information.

2.5.2 Documentation of Events without Intervention on the Filmed Reality

This is a form of "integral film documentarism", where who films has no possibility of "creating", "recreating" or "repeating" the recorded action. What has been filmed is usually unique and unrepeatable and the author is at the same time witness and observer; he films without interfering to change the actions. To this typology of documentary belong the newsreels pre-existing to the television news. A typical example is represented by war recordings and the ones concerning natural facts (a volcano eruption or urban life) or the recording of works (industrial cinema). The shots of natural phenomena as earthquakes, volcano eruptions and atmospheric events, represent useful material for the description and the popularisation of physiological and biological events. Moreover this material, untouched by formal intervention or stylistic cuts, turns to be an important archive source for the realisation of naturalistic documentaries of wider respite or for television broadcasts news.
Form a practical perspective, the awareness of the film-maker willing to tell a unique and unrepeatable event leads him not to "disturb", provoke or modify the reality he is recording. In this sense, starting from the sixties, the possibility to work with lighter equipment has facilitated operators and film-makers to "enter the reality" silently and less intrusively.

The Italian film director Vittorio De Seta[150] has used this style of documentation in one of his most important documentary, *Lu tempu di li pesci spada* (Italy 1995),

[150] Vittorio De Seta (1923-2012), interrupts his study in architecture to dedicate himself to cinema initially as assistant then as assistant-director of *Vacanze d'amore* (1952) by J. P. Le Chanois. In 1954 he debuts with the documentary *Pasqua in Sicilia* followed in the same year by *Lu tempo de li pisci spata* and by *Isole nel sole* awarded at Cannes Film Festival. He confirms to be a great documentarist with the next *Sulfatara* and *Contadini del mare*, both realised in 1955, in 1957 with *Pescherecci*, and especially with *Pastori di Orgosolo* and *Un giorno in Barbagia*, both of 1958. From his experience with the Sardinian shepherds originates his first full-length film *Banditi a Orgosolo* (1961), dramatic radiography of an almost archaic civilisation explored avoiding folkloric drifts or rhetoric. In 1966 he directs *Un uomo a metà*, about the crisis of militancy and

where he tells about the life of a group of Sicilian fishermen who every year repeat the ritual of the swordfish fishing. The director lives side by side with these men, entering with his camera the core of reality he wants to film. First full film-maker in the history of Italian cinema (he was director, operator, photography director and editor), De Seta carves the cinematographic matter with incredible skill.
His style recalls the lesson of Flaherty: to realise his film, De Seta has plunged in the life of a Sicilian village where the voices of the fishermen become sounds spreading from an ancestral struggle that has been living over centuries, the battle between man and nature.[151] Unlike Flaherty however, De Seta does not mean to intervene in the reality that he is recording and he does not reconstruct it, he rather lets the events happen as they actually occur.

> «The film is a work of rare beauty, constructed on the alternation of long-shots and close-ups, marked by a tripartite cadence – prelude struggle, chatarse - and by a climax - the scene of the capture of fishes, have nothingto envy to the masterpieces of the Russian formalism and which, in many frames, recall 'Tra Scilla e Cariddi', and the experiences of this young De Seta in the Panaria film studio. Vision full of pathos where the excitement for the deeds of the hunter, men faces and a swordfish is escape point to the mythological.»[152]

Another example of this documentary typology is offered by the works of F. Wiseman,[153] American film director who distinguishes himself for his capacity to

---

political involvement of an intellectual, revealing a punctual capacity of psychological-existential introspection. He then shoots *L'invitata* (1970) and, for TV, *Diario di un maestro* (1972), account of a didactic-educational experience in a suburb of Rome.

[151] Bertozzi, 2008.

[152] '*Il film è un'opera di rara bellezza, costruita su un'alternanza di campi lunghi e primi piani, scandita da una cadenza tripartita – preludio, lotta, catarsi – e da un climax – la scena della cattura del pesce, che nulla hanno da invidiare ai capolavori del formalismo russo. E che, per molte inquadrature, rimanda a tra Scilla e Cariddi e alle esperienze del giovanissimo De Seta nel laboratorio isolano della Panaria Film. Visioni patemiche e sudatissime, in cui concitazioni della vedetta e gesta del fiociniere, volti degli uomini e fuga del pesce spada assurgono al mitologico*.'
Marco Bertozzi, 2008, p. 158.

[153] Frederick Wiseman (1930), graduated in law at Yale, in 1967 shoots his first documentary, *Titicut Follies*, set in a prison institute. As *High School* (1968) represents an accurate and de-glamorising analysis of the American school, all the other documentaries by Wiseman try to disclose the irrational and normalising aspects of many American institutions (hospitals, centres of social assistance, tribunals, barracks), becoming an organic system of works reflecting on democracy and denial in the western world. Among his most significant works

penetrate into hospitals, schools and police districts, building a direct portrait of great spontaneity, without intervention or superfluous comments, underlining with the sole images the complexity and the inconsistencies of work environments. In his film *Near Death* (USA, 1989) he steps inside a hospital and describes the boundary line between life and death. With the camera on his shoulder, through a continuous movement along the hospital rooms and corridors, the film director poses on faces, expressions and words of patients, relatives and doctors, who really seem not to notice the presence of the camera. Wiseman does not build a narration but lets himself to be led by the events that animate the hospital, giving voice to an inclement portrait with a crude sense of reality made of anxieties, fears and desperations in the presence of the mystery of death.

The documentaries by Wiseman and De Seta offer useful material for an anthropological and sociological study. Moreover, in this case too, the use of fragments of this "pure" recorded material can turn to be a significant source for the populariser who want to deepen certain topics. Drawing on the images of Wiseman and even more on the ones of De Seta, by the integration with other archive videos or original recordings, and by a meaning creator editing, can be created divulging videos, whose efficacy is partly to be found in the exceptionally real shots of these two directors.

2.5.3 Survey and Reportage Documentary

The film-survey is a kind of analysis of reality (people, events, situations) that can be realised by different modes: from the interview to the personal account, from the out-field comment to the use of hidden cameras; "instruments" that can be also employed all at the once within the same video. This form has been practised and

are *Basic Training* (1971), *Ballet* (1985, of the American Ballet Theatre that turns into a reflection on any form of artistic creation), *Near Death* (1989) and *Domestic Violence* (2001).

experimented by the fathers of documentary-cinema as Vertov[154], Grierson[155], the Italian Zavattini and Pasolini, when the expression "survey-film" was not common yet, but the ground of application responded to the use of cinema as tool of inquiry, diagnosis and documentation of reality.

With episode films as *Amore in città* (Italy, 1953) and *Le italiane e l'amore* (Italy, 1961) Cesare Zavattini documents, investigates and researches the social occurring in dynamics active among social groups and in interpersonal relationships. His art, seen as opposition, provocation and knowledge, does not limit itself to shed an eye on the people 'met' by the camera, but aims to stimulate and solicit the audience towards a critical and participated vision.

After expressing for a long time his belief about the urgency to move beyond the Italian neorealist cinema with works closer to reality, Zavattini realised *I misteri di Roma* (Italy, 1963) a survey-film in more episodes that wanted to explore the social life in Rome in the very moment of the so-called economic 'boom'.

Another example of survey-film is *Comizi d'amore* (1965) by Pier Paolo Pasolini[156]. This film represents a crystalline example of cinema-verité in which the

---

[154] Dziga Vertov (Bialystok, Poland 1896 – Moscow, 1954), avant-guard documentarist linked to the "left-oriented" artistic movements, was a dominant figure in the revolutionary Russian cinema. In 1922 he founded the group of *kinoki* (cine-eyes), that published its manifest.

[155] John Grierson (Great Britain, 1898 – Great Britain, 1972). He is the founder of the English documentarist movement, whose theoretical and practical importance extends to this day. He has condensed the principles of his school (where have been trained directors and documentarists as Flaherty, Basil Wright, Paul Rotha, Harry Watt, Alberto Cavalcanti, etc.) on a Manifesto (1932) stating: the capacity of cinema 'of looking around and select the events of real life, the use of the "original" actor (or authentic) and scene, the greater beauty of the subjects taken from the reality'. As observed by Guido Aristarco, "However Grierson does not elaborate a real theoretical system; he rather gives this film genre, several remarkable works, among which *Drifters* (1929). But mostly, as G.P.O. (General Post Office) director, gathered a group of directors, technicians and theorists who divulged his principles through a series of documentaries that are still exemplar. Grierson, besides continuing his activity as journalist, essays writer and producer, he has directed other documentaries; one of them is *Man of Africa*. After repeated stays abroad (in Canada and United States) from 1947 he covers important charges at UNESCO. From 1951 he is the executive producer of the society 'Group 3' for the production of documentaries.

[156] Pier Paolo Pasolini (Bologna, 1922- Ostia, 1976) comes in contact with the world of cinema in Rome in 1950, when he writes the scripts for Mauro Bolognini and Mario Soldati. He realises his first film as director, *Accattone* in 1961, describing a Roman suburb. His next film is *Mamma Roma* (1962), followed by *La ricotta*

many voices interviewed trace a baffling and dreadful picture of Italy during the 'economic boom', a country imbued with hypocrisy, ignorance and conformism. In this review on public and private taboos, told by the voices of people met in different villages and cities, from north to south Italy, the hand of the artist acts in the direction of imposing an order to the chaos of raw reality. Pasolini, physically present in the frames, asks questions with a disarming ingenuity to people who answer with the same candour. The narrative scanning determined by a well orchestrated editing counts also on intervals in which the voices met along the streets mingle with the ones of "editors" as Alberto Moravia, Cesare Musatti, Camilla Cederna, Oriana Fallaci, Adele Cambria, Giuseppe Ungaretti, Ignazio Buttita and Pasolini himself.

> «Comizi d'amore is a"text" of high anthropological value, with high sequences where the old moral affiliations start crackling: interviews to worker women from Milan or to the football players of Bologna, to young people from Palermo or to countrywomen from Ravenna ... Also the debate of some intellectuals on the themes emerged in the filming, more than explaining the attitude of the people toward sex, enlightens us on the difficulties, at times, of a bourgeoisie struggling for understanding the complexity of the values at stake.»[157]

Comizi d'amore is part of a documentary branch called Cinema-verité, label launched by J. Rouch[158], which starting from the sixties developed in France and

(1963) and *Uccellacci e uccellini* (1966). It was the youth protest of that time to determine a break in the production of Pasolini, during which he elaborated a new theory of the cinematographic language. This theory first of all supported the end of the naturalistic scheme that had been characterising the Italian cinema since the postwar, to the advantage of a film writing that exhibited the presence of the film camera, disclosing the technical operation generating the image. This 'presence' of the camera and of the director moving it, would have characterised the cinema imagined by Pasolini in poetic terms, whose 'metric' was given by the 'verse' of the sequence-shot. Pasolini condenses the fruit of these intuitions in *Teorema* (1968) and *Porcile* (1969), where he reaches remarkable results from a figurative point of view. *Edipo re* (1967) and *Medea* (1970) express the crisis of a personality who, set aside the revolutionary spirit, tries to escape from reality driven by a tragic sense of life. *Decameron* (1971), *I racconti di Canterbury* (1972), *Il fiore delle mille e una notte* (1974). *Salò o le 120 giornate di Sodoma* (1975), his last film, is considered as a downright testament.

[157] Marco Bertozzi, 2008, p. 197.

[158] Jean Rouch (Paris, 1917 – Birni N'Konni Nigeria 2004), realised his first film in Africa to document his researches as scientist: *Les Maìtresfous* (1955), on witchcraft, and the full-length film *Les fils de l'eau*, 1955, which brings together a series of short-films dealing with different themes and shot between 1948 and1951, and *Jaguar* (1953-1955) unedited and uncompleted. In Abidjan, capital of Cote d'Ivoire, he realised in 1959.

then extended to other countries also thanks to the introduction of very light and silent cameras and of portable audio-recorders (magnetophones). The same Rouch with *Chronique d'un ètè* (France, 1961) realised the manifesto of this strand. This film-documentary is an ethnographic research on man and life in Paris and it is built upon the answers of the people interviewed. Other representatives of this documentary genre, favoured by portable and sound-synchronism cameras are: Chris Marker[159] with *Le joli Mai* (1963), Frédéric Rossif,[160] author of *Morire a Madrid* (1963), Mario Ruspoli with *Les inconnus de la terre* (France, 1961) and *Regards sur la folie* (France 1962), Bertrand Blier[161] with *Hitler… connais pas* (France, 1963).

Moi, un noir where the inhabitants of a shanty-town told about their world. In 1961 he realises with the same technique *La Pyramide Humaine*, on the attempt of white and black students, to cohabitate in a collage represented already that tendency of contemporary cinema referred to as cinema-veritè. On the way marked by Dziga Vertov, theorist of the 'cine-eye', reality had to be recorded 'horizontally' rather than 'vertically', and as the sociologist Edgar Morin (who had to become the inseparable collaborator of Rouch) said, 'penetrate the intimacy of daily life as it is truly lived'. In this sense a manifesto of this attitude had been *Cronaca di un'estate* (1962), where the question "Are you happy?" served to introduce a series of Parisian portraits. In 1964 Rouch realised *ManieFnance et Véronique*, on the personalities and behaviours of two girls who face their lives from two opposite standing points, for the episode-film "Le fleur de l'àge". In 1965 he realises an episode on "Gare du Nord" for the film *Paris la nuite*. In the same year he returned to the ethnographic documentary with *La chasse au lion à l'arc.*"

[159] Chris Marker (Meully-sur-Seine, France, 1921). French film director and writer. He is unquestionably one of the most important personalities of the European cinema during the postwar. He débuts as film-director in1952 with *Les statues meurent aussi*, pamphlet on the Negritude realised with A. Resnais and strongly opposed by the French censure. With *Dimanche a Pekin* (1956), Lettre de Sibérie (1957) and Cuba Sì! (1961), he redefines the rules of documentary focusing on the value of photography and editing, realising what the critic A. Bazin defines «essays documented by cinema». In 1962 he shoots *La Jetée*, a short film on the possibility to go through time (and much more), constructed by only few fixed poses and that will become the cue for *Twelve Monkeys* (1995) by T. Gilliam.

[160] Frédéric Rossif (Montenegro 1922 – Paris 1990), realised in the fifties many TV programs that raised great interest and scandal too. He also recorded the last interview to Einstein and made the popular *Cinq colonnes à la une*, channelling there the most uninhibited French journalism. He realised for the cinema some short films on artists (*Braque, ou le temps différent*, 1975; *Pablo Picasso*, 1980; *Brel*, 1981) ans a series of mixed full-length films of reconstruction and based on repertoire material (often unedited).

[161] Bertrand Blier (France1939). His style has always been characterised by a strong anti-conformism and by a provoking black humour since his first works. After debuting as assistant in the film *Il giovane leon*e (1959) and having realised the documentary titled *Hitler, connais pas* (1963), Blier directed his first full-length film

At the edge of the typology 'survey-film' it is important to remark one of the element that characterises this form of documentary and that owns a precise and independent 'soul': the interview. The collected data can spring by a person who asks questions and opens a sort of dialogue with the person interviewed. In this case the frame on his/her interventions make his/her presence explicit (through the modality of shot/reverse shot). Vice versa the interviewer can assume a more "discreet" role: limiting him/her self to ask questions, using the voice-over or eliminating the voice, to the sole answers is devolved the task to create a narrative flow. In this case the interviewer is not framed and it is used the technique of alternated editing in order to create a plot of answers of the different interviewed subjects and to proceed with the narration enriching it with different points of view at the same time. Understanding form and technique in the realisation of the interviews is fundamental in the audio-visual divulging.[162] The interview is indeed an essential tool when the purpose is to collect testimonial or putting in front of the camera experts and technicians.

Finally, as last example of reportage documentary, characteristic for its originality and innovation, I want to remember *The Man with a Movie-Camera* (Soviet Union, 1929), by Dziga Vertov, in which the author analyses and documents reality by using the camera as a "cine-eye", namely as a lucid and critic eye on the world.

> «The cine-perception of the world. This is the starting point: using the film camera like a cine-eye much more perfect than the human one, in order to explore the chaos of the visual phenomena that fill the space. Until today we have been outraging the camera, forcing it to copy the work of our eye. The weaknesses of human eye have been all marched out. We assert the seeking cine-eye.»[163]

To Vertov the filmed characters have to be as much as possible unaware of the presence of the camera, but unlike the documentarists who did not interfere in the filmed reality, the works of the Russian film-directors are not left without

(*Si j'etais un espion*, 1967) where played also his father. The success reached him seven years after, with the next *I Santissimi*, work that launched celebrities as Gerard Depardieu, Miou-Miou and Patrick Dewaere.

[162] For a close examination of techniques and interview forms: Coassin, 2011, *Tecniche di video intervista e inchiesta con la telecamera,* Logo Fausto Lupetti, Milano.

[163] Montani, 1975, p. 37.

elaboration. On the basis of the LEF (Left Front of Arts) theories, the director endorses the theory according which the camera has to catch the act, from live, the way it is; the image is at the core of the film and any literary or artistic influence is tolerated: "the denial of the actor and of the film elaboration, producing real images, not spectacle for the eye but enthusiasm of the soul" (from the essays of Kinoki). During the editing phase the film director cuts, modifies, assigns a proper rhythm and style to the shot. Although, the images are sewn together without a logic connection, as in the case of *The Man With a Movie Camera*, they betray a subtle net of correlations, at times purely visual, at others symbolic or analogical, which can be grasped more insistently.
Many hours of filming are reduced to the essential through the use of rapid editing; the film is the manifesto of a 'total' tendency and the real paradigm of this cinematographic production that the structuralists would afterwards have considered a due stage of the research.

2.5.4 Interview Documentary

As well as being important tools for the inquiry-documentaries, the interview documentaries own a formal autonomy and can base their structure on the intertwining of two or more interviews that often offer the richness of different points of view on the same topic. Also in this case, it is not only important the art of interviewing, but the editing becomes fundamental, framing disparate fragments in order to reach a unique and homogeneous flow. In these documentaries, besides the voices of those who are interviewed, there is no other intervention, so that the entire audio-visual relies on the editing as creator of meaning.

Shoah (France, 1985) can be considered an unquestioned example of this typology. The film director collects a series of accounts of commendable value by those who survived to the Nazi slaughter. The film is the result of twelve years of researches and it is entirely shot in Poland in the places that once had been the theatre of the recruitment and extermination of Jewish by the Nazi. The director interviews who survived, their executioners (ex SS) and the local people. The result is a

monumental work more than nine hours long, with a strong emotional impact and historical value. The narration of the protagonists-witnesses proceeds spontaneously, although in some cases the story is previously agreed with the director on the base of a conceptual scheme of themes.[164]

> «It is not easy to talk about the Shoah. In this film there is something magic, and magic cannot be explained. After the war, we have read a large number of accounts on the ghettos, on the exterminations camps; we were shocked by them. But today, watching the extraordinary film of Claude Lanzmann, we realise we did not know anything [...] I would have never imagined such a blend of horror and beauty. Of course, the one does not mean to hide the other one, it is not about aestheticism: to the contrary, it highlights it, with such creativity and rigour that we are aware of contemplating a great work. A pure masterpiece.»[165]

The most part of documentaries of Anglo-Saxon production (BBC, National Geographic, ITV) uses the form of intertwining interviews. In these films there can be a subject who ask questions and builds a sort of dialogue with the person interviewed and in this case his/her interventions are framed and explicit his/her presence (through the modality shot/reverse shot). Vice versa the interviewer can play a "discrete" role, the voice is out-field or can be also eluded, leaving to the sole answers the task to create the narrative flow. In this case the interviewer is not framed and it is used the method of the alternate editing in order to create a weaving of answers of the different interviewed subjects. To understand technique and form in the realisation of the interviews is fundamental in the audio-visual popularisation.[166] The interview is indeed one of the essential instrument to use when the aim is to collect sayings or making experts or technicians talk in front of the screen.

---

[164] Giannarelli, Savorelli, p. 48.

[165] Simone De Beaviour in C. Lanzmann. *Shoah* with an introduction by Frediano Sessi and the preface by Simone de Beauvoir. Einaudi, Turin, 2007

[166] For further explanation on the techniques and forms of interview: Gabriele Coassin, *Tecniche di video intervista e inchiesta con la telecamera*, Logo Fausto Lupetti, 2011.

2.5.5 Archived-Based Film

Archive-based film are documentaries characterised by the use of shots and filmed materials that are already recorded. They can come from journalistic sources (newsreel, newscasts), institutional audio-visual databases, private and family archives, or they can be sequences taken from fiction films. The characterising element of this narrative form is the editing (they are also called editing-films) by which, with different techniques and styles, each film director or populariser can give his image-based narration a personal nuance and convey the desired message.[167] In the archive-based films, an important phase is represented by the cataloguing, which allows to better know the material at disposal to be able to use it efficiently during the editing, that is when the narrative meaning of the documentary has to be built.

The number of films realised by this technique is really enormous, impossible to quantify and catalogue. As regard the distribution and marketing, it ranges from audio-visual products destined to television, to documentaries and films distributed on international scale. For my analysis I only mention two examples, characteristic for their originality and quality.
The first is a recent example of archive-based documentary realised by an Italian film director and presented out of competition at the 67th Venice International Film Festival: *1960* (Italy, 2010) by Gabriele Salvatores.[168] Using the entirely black and

[167] For further explanation on the techniques and forms of editing: Diego Cassani, *Manuale del montaggio. Tecnica dell'editing nella comunicazione cinematografica e audiovisiva,* Utet, 2000.

[168] Gabriele Salvatores (Naples 1950). Graduated at the Academy of dramatic art of the Piccolo Teatro of Milan and among the founders, in 1972, of the Teatro dell'Elfo for which he realises, over ten years, twenty-one shows. The success of the musical based on *Midsummer Night's Dream* by William Shakespeare leads him to direct the full-length film *Midsummer Night's Dream* that in 1983 wins an award at the Venice Film Festival. In 1987 he realises *Kamikazen - Ultima notte a Milano*, with Paolo Rossi and Nanni Svampa, and in 1989 *Marrakech Express*, road movie with Diego Abatantuono. The next year he directs *Turné* (1990), where he combines the themes of travel and theatre. In 1991 it is the turn of *Mediterraneo* that obtains the Oscar in 1992 as best foreign film. After *Puerto Escondido* (1992) and *Sud* (1993) he realises the science-fiction *Nirvana* (1997). In 2000 *Denti* and in 2001 *Amnèsia*, a new return to the escape film. He changes register in 2003, when brings to the cinema the novel of Niccolò Ammaniti, *Io non ho paura*. In 2005 it is the turn of the noir *Quo*

white archive material from Teche Rai, Salvatores invents a story to retrace one of the symbolic year of the Italian "economic boom". The film commences with an over-voice of an adult (Giuseppe Cederna) who recalls the travel he did with his parents when he was a child to visit his emigrant brother in Milan. The images of the rout, from a small southern village up to the north, show a country in full of its economic boom, where occupations, trends and daily life are changing at a dizzying pace.

Through the out-field narration, it is told a fantasy story on which are inter-weaved real images of that time, wisely edited. The purpose of Salvatores is to depict a mild and nostalgic picture of a unique period, dominated by immigration, the birth of new professions, cinema and television. The director describes the realisation of his film:

> «The cinematographic editing can radically rewrite the story of a film. Generally, it can also modify or re-write also the story of the years we have experienced. Using these reflections as a starting point, we have tried to make up a story with real television images dating 1960. [...] More than a documentary, it looks like a film based on dreams and memories. We would like to thank all the journalists and the cinematographic operators who unconsciously provided us with their images, to which we have attempted to give new life and meanings. Beautiful images. It is not a case that 1960 is also an extraordinary year for the Italian cinema.»[169]

Another example related to this documentary style refers to a film made through the use of archive family material for the creation of a diary-film. It is the documentary of Alina Marazzi[170] *Un'ora sola ti vorrei* (Italy, 2005). It is the

Vadis Baby? At the end of 2008 he returns to the cinema with *Come dio comanda*, adaptation to the novel of Ammaniti, winner of the premio Strega. In 2010 he amuses public and critic with *Happy Family*, a metropolitan comedy set in Milan at the end of the summer.

[169] Ilaria Flacone, 1960. *Magia e nostalgia. La storia di un bambino che voleva fare il mago ed è diventato regista*, NSC anno VI n. 23, 7 settembre 2010.

[170] Alina Marazzi (Milan, 1964) is director of television documentaries on social themes, she has worked as assistant director for cinema, mainly with Giuseppe Piccioni. She collaborated with Studio Azzurro both on cinematographic projects and installations. Among other activities she has run audiovisual laboratories in the prison of San Vittore in Milan and for two years she worked for the project Fabrica under the artistic direction of Godfrey Reggio. Her work has been positively welcomed by the critic and by an international audience in

reconstruction of the personality of a mother made by her daughter (Alina Marazzi) through the editing of the 16 and 8 mm films realised by her grandfather. The attempt of the film director is to reconstruct the story of a person who committed suicide as she was only seven years old. The film is imbued with an evocative and nostalgic atmosphere where the images, in their scraggy and often poor quality, seem meant to convey the proofs of a troubled and tormented life. It is a work that forces into a journey inside the woman subjectivity, bringing out, under the lines of words and images, the dynamics of a family upon which heavily burdens the 'not-said'. The words of the director help us to understand the creative process of her work:

> «Four or five years ago I realised that there were many videos filmed by my maternal grandfather and therefore I began to watch these old films, most of them in 16mm, some in 8 mm. I found out a small cinematographic treasure. We have edited the images, which were all mute, and we understood that they owned an emotional and visual power and that we could continue to look for other material and enrich it to do a small film to be kept private, but that could also tell something to other people. The reconstruction of the talkies has been done on a second time. When we had already done a selection of images giving them a rhythm, I started to think of how I could tell that story and it was becoming increasingly clear that I should have put the story of my mother in first person. I took and read the diaries and the letters that have been kept for thirty years. In the film is as if it was always her to talk, there is my voice reading diaries and letters since she was twelve until she was twelve up to thirty-three. While I was working on the selection of the passages that arrived at the editing room, some sequences of images suggested the combination with words, but other ones not, we felt the need to enrich the soundtrack with a carpet of sounds and music.»[171]

The documentaries of Salvatores and Marazzi demonstrate how from archive material can be built histories that tell real events or that are partially invented, disconnecting the images from their initial context and providing them, by a creative editing, with a new meaning.

---

occasion of her first film-documentary *Un'ora sola ti vorrei*. Presented in Locarno in Concorso video, the film receives the special mention of the jury and afterwards the first prize as best documentary at the Turin Film Festival. After the success of this intimate and personal film, she realised *Vogliamo anche le rose* (2007) by which she intends to retrace the history of women from the mid sixties to the end of the seventies, creating a sort of resonance with our conflictual and contradictory present.

[171] http://www.altrocinema.it/archivio/archivi/alinamarazzi.htm.

These are "hybrid audio-visuals", because if on one hand they are made with recordings ascribable to the documentary (institutional or private), on the other one the elaboration of this material during the editing has led to the creation of full-length films in which the documentaristic footprint fades in favour of histories.
From the perspective of popularisation, my analysis consents us to consider the absolute importance of a technical-creative element as the editing. In communicating science, as it occurs through these films, the phase of post-production can be decisive for the construction and transmission of contents. Avoiding to recall the theories of editing of the last century,[172] it is clear that by disposing of massive undifferentiated and chaotic audiovisual material, it is possible to arrive at the creation of a meaningful film, communicating a clear message avoiding the risk of misunderstanding. If, thanks to the editing, as in the case of *1960* and *Un'ora sola ti vorrei*, we dispose of documentaries rich of poetic and evocative atmospheres, we can state that the creation of scientific popularising films by the juxtaposition of archive images, music and out-field comments, is one of the most effective model the populariser disposes of to achieve a plain and powerful communication.

2.5.6 The Film-Essay: Metalinguistic Films and 'Short-Circuit' Films

Belong both to this category, meta-films (films about films) and documentary films referred to as short-circuit, for which it is hard to establish the boundary between documentary and fiction, putting into question the linguistic codes they refer to.
The first example of meta-film is the documentary of Keith Fulton and Louis Pepe, *Lost in La Mancha* (Great Britain, 2001), risen from the ashes of a film that failed during the production titled *The Man who Killed Don Quixote*, by Terry Gilliam.[173]

[172] The different theories and editing techniques are accurately explained in the book: Cassani, (2000), *Manuale del montaggio. Tecnica dell'editing nella comunicazione cinematografica e audiovisiva,* Utet, Milano.

[173] Terry Gilliam (Minneapolis, 1940), Gilliam definitely decides to undertake the way of cinematographic direction and with the same creative freedom he realises *Jabberwocky* (1977), set in a invented Middle-age. After the journey into the past of *I Banditi del Tempo*, he begins to write the script for *Brazil* (a reinterpretation of *1984* of George Orwell), which he will direct in 1985. After *Brazil*, in 1989 he writes *The Adventures of*

This film met some obstacles since the pre-production phase and went by the board only after six days due to an incredible concomitance of unlucky events. *Lost in La Mancha* testifies its own progressive failure. In origin thought as a "making of", it has subsequently been fleshed out with interviews, *ad hoc* drawings and video inserts, becoming an important means to understand the magic of cinema and the efforts necessary to its realisation. *Lost in La Mancha* is a clear and simple documentary, and it especially extends its sphere of activity outside the story and the film production itself. It indeed explores a double dimension: the way Don Chisciotte is presented to the cinema, what he represents, and the events that during their production involved various films of Terry Gilliam.

The typology of the essay is always congenial to the already mentioned Chris Marker, author who since his début towards the end of the fifties to this day, has developed a cinematographic language under constant renovation: from the cine-novel to the static images of *La Jetée* (France, 1962), to the pamphlet of political counter-information *Loin du Vietnam* (France, 1967), to the digital technology with the CD-ROM *Immemory* (France, 1998), honing over time the art ODF the essay-film: fascinating intersection of philosophical reflection, documentary image, *found footage*, digital technology and archive material.[174] The most representative documentary of this typology is *Le Fond de l'air est rouge: scènes de la Troisième Gruerre mondiale, 1967-1977* (France, 1977), a full-length film where the French director retraces the current events editing the images of the revolutions that cover the decade 1967-1977. The fragments recorded, reassembled and provided with

---

Baron Munchausen, where astonishing special effects (among them, a journey to the moon and a fall into a Vulcan) are melt with irreverent humour in a screwball eighteen century. In 1991 he realises *The Fisher King*. From the dramatic comedy he passes to the science-fiction with *Twelve Monkeys* (1995) with Bruce Willis and Brad Pitt. Two years later is the turn of *Fear and Loathing in Las Vegas*: the lawyer Benicio Del Toro and the journalist Johnny Depp travel (it is a mental trip rather than a geographical one) on a convertible from Los Angeles to Las Vegas. In 2001 he starts the shooting for *The Man Who Killed Don Quixote*, story of a publicist happened by chance to be Sancho Panza, in the service of Don Chisciotte in Spain in the 70th century. After six days of shooting and many accidental obstacles (hurricanes, illnesses and lacking funding) Gilliam abandons the project. But the backstage footage becomes a documentary: in this way it is realised *Lost in La Mancha* (by Keith Fulton and Louis Pepe). The director restarts his activity in 2005 with *The Brothers Grimm* and *Tieland*. The last suggestive and imaginative work is *Parnassus* (2010), where the overstep between reality and fiction reaches a breaking point with the premature death of Heat Ledger.

[174] Ivelise Perniola, 2003.

new meanings, come from scruffs of films or are over-used images from television, transmitted and soon phagocyted, removed from collective memory.

The Short-Circuit Film

When the film credits or the first sequences of a documentary appear, the public with an audio-visual middle-culture can immediately tell what genre it belongs to: the type of audio-visual codes and grammars inform us about the typology of a film that we know is not the fruit of fantasy but of real histories. However there are some works that put into question these typical features. Some full-length films make use of elements belonging to the documentary, creating in the spectator a sort of disorientation, who is not longer able to discern if what he is watching is real or fiction. These are films that blend forms and genres and that while want convince us (for example through an over-voice) that what we see is the reality, their images bring into question the same words. The short-circuit films cause the crisis of that implicit deal each person acknowledges when sat in a cinema or in front of a television documentary.[175]

This is the case of *F for Fake* (France, Iran, Germany, 1975) by Orson Welles. In a railroad station Welles juggles and holds a lecture on the relationship between truth and invention in art, cinema and life, telling different stories where appear Elmyr de Hory; painting forger, Clifford Irving, memoirs forger; the billionaire businessman Howard Hughes; the famous radio broadcast on the invasion of the Martians; Pablo Picasso, the beautiful Kodar and her grandfather, a forger. The topics it deals with refer to the caducity of fame, the concept of author and art as lie telling the truth. A patchwork of heterogeneous materials as static images, drawings, library pictures, documentary shots, among which Welles is depicted as subject and artificer of the whole.

Through a cinematographic slow-motion, tool that par excellence creates the falseness of the editing, able to alter images and compromise their objectivity, the film director does not hide that each element of the film is the fruit of a “stealing”

[175] Giannarelli, Savorelli, 2007.

from the documentary language. *F for Fake* enacts the falsification process at a double level: the narrative and the linguistic one. The art of forgery is exalted and sublimed through the cinema, but also de-constructed and analysed in each of its fragment. The film of Welles is at the same time a short-circuit film and a meta-documentary film.

The typologies explored, meta-film, essay-film and short-circuit film, due their ambiguity and hybrid nature, are forms hardly usable in the field of popularisation. The meta-linguistic genre can find little space in the popularisation concerning the art of cinematographic or television. It is however evident that the diffusion of science needs a clear communication system, the massage has to be plain and direct, without misunderstandings, and it cannot make a multiple use of different interpretative levels as the documentary can instead do.

2.5.7 Experimental and Advanced-Guard Film

In the vast range of documentary cinema can also be included a category with an autonomous configuration. The experimental and advanced-guard film represent one of the extreme of non-fiction films, since a variety of features, together or isolated, animate this typology: the refusal of fiction in terms of industrial system, but also in terms of narrative form inferred from other languages, a variety of visual materials treated as exhibits, the indifference to standardised cinematographic grammars and syntaxes, great variety of formats and seizes.[176]
These features describe the space within which we can collocate those audio-visual that cannot be considered fiction films or documentaries fitting with the models here taken into account.
It is an autonomous typology that markedly presents the dimension of its "diversity", the proud claim of being something different form the official cinema. However some of the elements we mentioned create an inevitable bond with the

[176] Giannarelli, Savorelli, 2007.

documentary cinema, which also hangs in the balance at the limits of cinema, if not even out of it.

The experience of the Studio Azzurro,[177] its works and multimedia installations, have often used this film typology. One of the aim of Studio Azzurro is to use the experimental film in interactive and multimedia contexts, most of the time inside museums, where the art has become channel of information and transmission of significant cognitive flows. The video production aims to fascinate the audience through video-installations modified by the intervention of the ones who look (passages of fingers, feet, clapping hands and voices). "Narrative-museums" are places where no collections are displayed; the nature of what is exposed is rather immaterial and non-tangible as memories. In these spaces, the video becomes an

[177] Founded in 1982 by Fabio Cirifino, Paolo Rosa and Leonardo Sangiorgi, in 1995 mingled with the group of Stefano Roveda. The first work of "Studio Azzurro" is the video-ambient from 1982 to 1993, where the employment of television monitors establishes a minimal dialect with the environment. During a next research phase, started in 1995 and still on going (the one of the sensitive environments, that is animated video-installations with the intervention of the spectators), the monitors disappear and the video-projected image spreads in to the environment, adapting it self to the most diverse materials. Another peculiarity in the methodology of this group consists of the mixing of expressive codes taken from different disciplines: from science to art, to philosophy. Through the video-environments, sensitive and interactive environments, theatrical performances and films, Studio Azzurro has marked a production world-wide recognised and appreciated, by a large number of important artistic and theatrical manifestations. As well as to experimental works, the group is linked to more divulging experiences as the planning of museums and thematic expositions. In both cases, it has attempted to build a communicative context to enable the active and significant participation of the spectator within a narrative structure, inspired by a multi-textuality and to a continuous oscillation between real and virtual elements. The collective production of Studio Azzurro is relevant in the arena of the European video-art since the video-ambient of the eighties ('Luci di inganni', 'Il nuotatore', 'Veduta', the cycle 'Osservazioni sulla natura'). The invention of audio-visual image systems that change under the external touch (passage of feet or gingers, clapping hands, voices, etc.) dates back to the nineties. Are then originated great interactive settings: 'Tavoli' (1995) 'Totale della battaglia' (1996), 'Il soffio sull'angelo' (1997). In 1996 it has been realised a permanent video-installation in the New Metropolis of Amsterdam, "Il giardino delle anime". The group is also involved in inter-disciplinary experiences linked to theatre, dance and music. The research of Studio Azzurro also embraces the world of short and full-length film, led by a spirit of continuous experimentation. One of the project that met a large approval by the public is the ideation of the exhibition on De Andrè, which the Foundation Fabrizio De André onlus has also organised at Palazzo Ducale in Genoa; the themes of marginalisation and anarchy have been subdivided in diverse environments (words, music, people, life) and developed by multimedia trips.

integral and indispensable component for the visitors to penetrate an environment where the transmission of information is facilitated by a total sensorial stimulation. Noises, sounds, music, videos, texts, create a cognitive texture where the visitor, able to interact with elements he stands for, opens up to takeover the different atmospheres created.

In occasion of the big exhibition dedicated to Fabrizio De Andrè in the Ducal Palace in Genoa, Studio Azzurro proposed an interactive trip by which the visitor could communicate with the life, the works, the music and the words of this singer-songwriter, but also participate, with a gesture or a small video gift, to the multimedia narration of the exhibition. This was organised in order to make the narration and the visual, textual and musical representation dense of suggestions and emotions for a large audience, which could from time to time choose which image of De Andrè to develop and deepen, according to one's own personal experience and background. The exhibition dealt with the recurring themes of De Andrè poetic: the affluent society of the sixties, the emigrants and the outcasts, freedom, anarchy and ethics, the linguistic and musical research, the representative places of his life; all of them displayed in order to create the sense of his powerful ability to address the single individual maintaining a universal message.

The videos played a key role in the exhibition. Their uninterrupted flow, as well as contributing to the fascination and immersion of the visitor, were the most immediate and direct source of documentation.
Although the transmission of contents through the videos constituted only a small portion of the sensorial magma that was proposed, they revealed a great communicative power. Interviews, private life sequences, images of concerts allowed to get to know at the same time the man and the artist De Andrè.

Art and popularisation are concepts that, because of their nature, can cohabit only in exceptional cases. In the case of Studio Azzurro and of this exhibition on Fabrizio De Andrè, the experimental video has showed all its potential including its powerful cultural communication. The video-art remains however a marginal and dangerous ground when it comes to scientific popularisation. The concept of art

inevitably implies the possibility for the audience to personally interpret and re-invent the meaning through the activation of "unconscious motors". We are therefore far from the scientific communication where the message looks for the best channel, with no blunders, to reach the recipient in a plain and unequivocal way. However, the exploration of this model has been useful in order to point out the great possibility of usage of the audio-visual materials, interpretations and the possibility of integration and creation of new narrative flows.

2.5.8 From the Documentary to the New Forms of Communication

The description of the experimental film leads the analysis from language and documentary forms to the exploration of the communicative channels used for the popularisation of science. As the next chapter will show, the advent of television and, towards the end of last century, the progressive entrance of new digital technologies, brought to the birth of innovative audio-visual solutions, widening the possibilities of production and fruition.

From the sixties and seventies, the film-maker does not only dispose of the film camera, but also of television and video cameras. Moreover, in terms of the multiplication of productive systems and of the fragmentation of fruition, it is evident that the old-designed documentary had first faced the transformation of the recording techniques, the diversification of the diffusion channels and subsequently the extension of its language.

> «From a mass-media perspective the 'death' of documentary occurs during the changeover from the film to the video. Symptomatic is the slow fading which leads the super8 towards the first non-professional film cameras. A generation of simple amateurs gives slowly way to the emergence of new figures (the video-maker) and new filming devices (the film-camera). The eye on the present fragments itself into a "media-nebula". The growth of the unique television model marks a reality in which the stories have to exalt the consumption and the mise-en-scene.»[178]

[178] Bertozzi, 2008, p. 240.

In the next chapter, I will trace a portrait of the possibilities the populariser can handle to convey scientific knowledge and contents by means of a high consumption media such as the television. I will therefore analyse the broadcasts that from the advent of TV to this day have been characterising scientific popularisation. Next, I will analyse the forms of production and fruition of scientific audio-visuals risen with the advent of the Internet (from web 2.0 to 3.0), providing a future access to new communicative ways for those who want to divulge science in a clear, direct and competent way.

Divulging technological and scientific discoveries is not always an easy task. In some cases these finds are fruit of a very high degree of specialisation in fields where the theoretical notions are hardly graspable by the mass. However, often, in an attempt to use words accessible to the majority, it is easy to take a chance on misinterpreting the reality. Understanding easier through a descriptive illustration.[179]

3

From Pedagogic TV to Web-Video

3.1 Introduction

Among the different channels that vehicle scientific information, television is doubtlessly the most powerful mass media. If the scientific cinema, since the early 20th century, made the voices of the scientists audible and appreciable, starting to arise curiosity and large interest in the discoveries and in their promising applications, television has gone far beyond that. It has indeed started to show the researchers at work inside the laboratories, dealing with increasingly sophisticated equipment, describing - for instance - the DNA structure or the simulated flight during an aeronautical experiment. A television programme of scientific popularisation can bring the public up to date about the importance of the most recent finds and about natural phenomena, like no other means of communication can do, web included.[180]

> «The television, at its origin, was indeed conceived and structured as the widest instrument to vehicle 'knowledge and culture' and if 'men of television', in so far belonging to this world, were automatically considered and acknowledged by the spectators as

[179] Giulio Natta*:* Chemist and academic, Nobel price in chemistry in 1963.

[180] Apollonio, 2002, p. 111.

> warrantor of truth and accuracy of contents, television was then recognised and imposed itself as a great distributor of culture.»[181]

In every European country, between the fifties and the sixties, the television established it self in terms of a public service directly managed by the State, reflecting the specificity and the cultural features of each country.[182] Television, following the model offered by radio, was deeply linked to politics. In this sense, the pedagogic intent was safeguarded by different forms and modes, according to the public age of the different countries.[183]

In the Unite States, television began its scientific divulging programmes in 1951. On that year was aired *Mr. Wizar*[184] considered by many commentators as the model-programme of scientific communication on TV. Together with *Omnibus,*[185] another programme of that time, *Mr. Wizar* represents the progenitor of an innovative and popular way of communicating science, for it used this new means represented by television, to which the spectators approached with interest and curiosity. With regard to the rest of the schedule, until the early sixties,[186] the presence of science on American TV was limited to sporadic interventions under

[181] Grasso, 1998, p. 73.

[182] The only exception was represented by Great Britain, which proposed an international private web consisting of various regional societies under the control of a public authority.

[183] Menduni, 2002, p 25.

[184] On the air from 1951 to 1966 and again in 1972. The programme presented again the format of the lecture, assimilating the spectators to a very large classroom. The programme was realised in real laboratories or inside equipped studios with realistic scenarios that guaranteed the watchers the illusion of truly entering the world of research allowing the scientists to maintain a certain degree of authoritative and professional detachment. (cf. Grasso, 1998, p. 198)

[185] *Omnibus*, broadcasted every Sunday afternoon during the fifties. Structured on the model of a news magazine, it reserved one section to scientific contents.

[186] It is important to remember the importance of popularisation of the American spatial enterprise. Since the seventies the television offered the possibility to unify science, entertainment and national pride. 1969 marks the peak of the process through which the television assumed a main role with regard to the American spatial project. With the live programme displaying the landing on the moon and with the Pioneer 10 mission, it was given the space for a new form of popularisation, defined ‘instance science’, based on the immediate spectacularisation and on the subsequent comment of scientific events, communicated in real time.

the form of science-fiction comedies, naturalistic programmes not organised in series and programmes with single lectures.[187]

By focusing the attention on Italian television, the analysis of the scientific programmes from the advent of TV to this day, I have highlighted the inevitable evolution of stylistic and technical elements. During the first years of programming, within the scanty offer of a single national channel, cultural and scientific programmes of popularisation found a great space for expression, giving a fundamental contribution to the pedagogic mission of Italian television. The historical analysis of the strategies activated through the schedule and the texts diffused, shows that the dominant tendency was to make education and popularisation coincide. The intent was to transpose talks, concepts, discoveries and scientific theses through an accessible and clear language.

Starting form the sixties and after the institution of Rai 2 channel, the range of scientific programmes widens, generating an enrichment from a formal and stylistic perspective. This gives the start to deeper elaborations and technical experimentations, integrating new graphic models and updated visual symbolisations. All that within a social context that is experiencing a deep and rapid development, where the new economic well-being opens the possibility to an increasingly wider range of population to purchase the television. People come close to themes, as the scientific ones, hitherto unknown.

At the end of the seventies, TV is the protagonist of a profound transformation. The advent of private televisions, the technological progress and the massive introduction of advertising stimulate the birth of new genres and styles and modify the relationship with the television watchers.
Amid this media revolution, the programmes of scientific popularisation renew themselves too. Except some programmes that maintain their original setting, integrating innovative technologies and graphic effects (*Quark*), other programmes,

[187] Grasso, 1998, p. 199.

by a rapid rhythm and a catchy language, emphasise the spectacular effect, often to the detriment of the scientific depth.

In this chapter, after an analytical account on the evolution of the scientific programmes of Italian TV, I will focus on the critical reading of some of the most important popularising programmes within the current television programming. The study will allow to extrapolate a selection of technical tools and dramatic solutions that can be used by authors to divulge science on TV, highlighting potentialities and limits of television in this specific communicative area. Next the study will analyse new forms of integration between audio-visual and web.

3.2 History Italian TV

3.2.1 The Beginning of the Broadcasts

With the beginning of the broadcasts, on 3rd January 1954, Italian television characterises itself for a schedule where programmes are governed by a pedagogic intent and well defined ethical rules.[188] In the early years, its leading executives link the audio-visual diffusion of the single Italian TV station to a firm catholic matrix, very attentive to the religious aspects, trying to use the new means of communication to better the Italians. The pedagogic intent is clearly present in the programmes of scientific popularisation that represent one of the flagship of the schedule. On prime time are proposed programmes were the anchor-man tries to divulge science by a plain and simple narration. On second-time instead, are displayed programmes characterised by more elaborated texts and by the presence of experts in studio. The broadcast is organised on the basis of a segmentation of the palimpsest, and therefore of the public too, in relation to the time slot and the days of the week, so that each programme could enjoy of a specific audience.

The first, official scientific programme of Italian TV is ***Una Risposta per Voi*** by Alessandro Cutolo[189]. This broadcast[190] uses a divulging model and a language derived from radio, whence the anchorman comes. Initially aired in the afternoon and afterwards, because of the success obtained, transmitted on prime-time, in this programme Cutolo hosts scientists and experts, offering the watchers pills of knowledge. At a time when one out of three Italians was not able to read, the intent

[188] For a deepening on the birth and the early years of the Italian state television, see Grasso, *La storia della televisione italiana*, 2000.

[189] Alessandro Cutolo (Naples, 28 March 1899 – Milan, 14 March 1995) was an Italian television host, historian and actor. After graduating in palaeography, he continues his study in law and philosophy. He was director of the State Archives and of the Historic Archive of Naples, as well as collaborator of newspapers and magazines and director since 1957 of the periodical «Historia». Professor of medieval and modern history, skilled speaker and communicator, since the birth of the small screen, from 1954, he hosted a feature entitled *Una risposta per voi*, which gained large consensus. He was the first cultural communicator within Rai. He also frequently appeared on cinema, almost always with Alberto Sordi, with whom he made his début in 1962 with the film *Il commissario*.

[190] It starts out on January 7th 1954, on the air until 1968.

of Cutolo is to divulge science and knowledge by embracing a pedagogic model that for some decades has represented the imprinting of the state Italian TV. Indeed the success of the programmes is due to the sympathy of the anchor-man, who with Neapolitan accent and his propensity to the jokes, succeeds to gain the loyalty of a large audience. At times, to get the people understand him better, Cutolo draws out the cupboard set in the studio small objects that he uses to integrate his explanations. The setting contributes also to a warm and cordial atmosphere: the presenter seems to converse with the viewer, walking around the studio (sometimes even with his dog).[191] In *Una risposta per voi,* the art of narrating science becomes one with the ability of the anchorman-narrator, who becomes to all intents a character of a sort of knowledge fair.[192]

After the successful début of *Una risposta per voi*, in order to meet the expectations of a vast and heterogeneous public, Rai enriches its palimpsest with new programmes of scientific popularisation. Maintaining its pedagogic-educational role, the aim of the state channel is to divulge science and knowledge trying to involve followers or simply curious people. Are thus conceived ***Piccola Enciclopedia Scientifica***[193] and ***L' Enciclopedia di Lascia o Raddoppia***[194]*,* features anchored by Mike Bongiorno offering popularisation "in pills". These programmes focus on curiosities and anecdotal digressions without deepening the contents proposed.

With typically didactic aims were conceived the programmes ***Avventure della Scienza*** and ***La Macchina per vivere***.

Avventure della Scienza[195] is edited by Bruno Ghibaudi and Enrico Medi (director of the National Institute of Geophysics). In half an hour this programme reviews many singular news, looking for an answer to the most unexpected questions. The

[191] Grasso, 2000.

[192] Grasso, 1998, p. 77.

[193] On the air from 8th November 1954 at 18.30, it was half an hour of scientific curiosities, a sort of short reviews of singular news and answers to the most weird matters. (Cf. Grasso, 1988, p. 75).

[194] On the air from 1956, and lasting 15 minutes, it wanted to list a series of encyclopaedic voices illustrated with images. A short monograph dealing with different selected topics. (Cf. Grasso, 1998, p. 75).

[195] On the air from 14th September 1954 to 1956.

programme permits the watcher to enter for the first time the scientific laboratories where are disclosed the secrets of the physical and chemical research.

La Macchina per Vivere[196] aims to illustrate the functioning of human body and of its organs, proposing inside the studio scientific debates to explain through experiments and supplementary videos the fundamental functions of human body. The scenography of the studio resembles an usual classroom with blackboard, desk, and small-case models of human body in all its components. The anchor-woman, professor Di Giorgio, wears a white gown and uses a stick to indicate the various drawings on the blackboard. Her role is the one of the teacher-communicator, responsible of conveying knowledge to the spectators-students.
With her there is professor Enrico Meda, the technical expert of laboratory who illustrates and explains the topics explored through the use of the microscope. The analysed elements are integrated by the questions of a young assistant who has the role of leading the debate to a more understandable level for the viewer. The assistant, always side by side professor Di Giorgio, recalls the typical spectator, namely the common sense. Besides the experiments with the microscope, are also used videos, drawings on the blackboard and small-scale models, which give the idea of a sort of multimedia high school class.
With ***La Macchina per Vivere*** the intent is to defeat the superstitions, the illusions and the false popular believes, conveying a type of culture within range of everybody, rather than restrained to scientists and intellectuals. Its language, although rather elementary, is extremely clear and understandable.

As it can be seen at first glance, *Avventure della scienza* and *La macchina per vivere*, first examples of scientific popularisation, present a similar structure (also found in many programmes conceived for children). The primary task of these two programmes is to be clear as much as possible, making use of a class "pattern", whose simple language is supported by short videos in the case of *Avventure della scienza* or by practical demonstrations as in *La macchina per vivere*. In both cases

[196] On the air from 31st January 1957 every Thursday at 10.45 pm, edited by Anna Maria Di Giorgio (holding the chair in human physiology at the university of Turin) and by professor Stoppani (radiologist), with the presence in studio of Meda. It was a cycle of 14 scientific broadcasts.

the studio consists of a sort of classroom-laboratory where the presenter-teacher illustrates and explains, sustained by scientific tools, models and equipment typical of scientific laboratories.

> «*Avventure della scienza* and *La macchina per vivere* represent the full affirmation of the figure of the expert, namely the official depositary of knowledge, the one who, in the service of the viewer, is seen as the source, the ordering principle and warrantor of truth. The expert, often wearing a white gown and represented while at work, surrounded by tables and diagrams, fulfils the role of giving credence to the truth of what is said; he guarantees the reliability and completeness of information.»[197]

Another programme that at the end of the fifties introduces in a simple way science to a non-specialised audience, is ***L'amico degli Animali***[198] by Angelo Lombardi. Through a colloquial lexical Lombardi divulges the principles of ethology. He is supported by an assistant and a black man dressed as an "ascaro" (italianised Ethiopian), whose role is to bring into the scene the animals. The effect obtained is definitely anthropocentric: the nature is seen as a force that needs to be subdued by man. This ideological conception would result today unbearable, and yet *L'amico degli animali* is the first programme of a strand continuing in 1958 with ***I racconti del naturalista*** arriving at this day with ***L'arca di Noè***[199]. This typology of popularisation, vehicles at the same time an ecological and naturalistic idea of science.

In 1958 starts out the broadcasting of ***Telescuola***[200], consisting of real lessons addressed to the alumna resident in areas lacking of secondary schools and aiming at a professional education. It is the first educational course on TV (anticipating the programme *Non è mai troppo tardi*) and its didactic dimension is obviously

197 Grasso, 1988, p. 81.

198 Starting from 7th February 1956, at 10 pm., it continues until the next year, with 78 episodes.

199 L'arca di Noè. Programme of the Nineties by Lica Colò.

200 Telescuola. Aired since 25th November, edited by Italo Neri, who in six years achieves to get in contact with watchers scattered in different small centres all over Italy, contributing to the literacy of the country. Among the promoters there is also Marco Danè, who afterwards became author of successful television formats. Of great importance was the cycle of over 300 parts went live and realised by the painter and art theorist Enrico Accatino, from which would have been shaped a new discipline: art education, integrated in 1965/1966 within the Middle School Reform, substituting the course of 'Disegno e Ornato'.

fundamental. As support and facilitation to the learning process it is devised an effective system of mediation between the students spread all over Italy and the 'tele-teachers' (selected with the collaboration of the Minister of Public Education). The project institutes 1.626 listening places at the tele-school (PAT, 'Posti di Ascolto di Telescuola') and thanks to the mediating presence of a coordinator, the lesson on TV is suitable to the needs of a group audience. *Telescuola* is the first educational course on TV activated in Europe and attendance allows to obtain a regular middle school professional qualification. The subjects of the courses are indeed the same as the ones envisaged by the ministerial programmes for the school introducing to the occupational industrial sector.[201] On the wake of the success obtained, the experience of *Telescuola* continues over the seventies too.[202]

The pedagogic intent characterizes as well in ***Non è Mai Troppo Tardi***[203]*,* cycle of transmissions for illiterate people edited by Alberto Manzi, who becomes the most famous teacher in the country of that time. Through this programme one million four hundred thousand Italians achieve the primary school qualification by attending its TV lessons. The process of linguistic literacy promotes the linguistic, social and cultural unification of the country, which begins to look at this new media with hope and wonder.
Non è mai troppo tardi contributes also to foster the myth of a television able to set free from ignorance, to abolish inequalities and improve everybody's life.[204]

---

[201] Grasso, 2000, p. 68.

[202] On 16th October 1961 Rai, under request of the minister (that takes charge of organising 1200 television classes), starts the courses for the first class of the new Unified Middle School, which will come into effect on national scale two years later. The lessons, daily transmitted from 8.30 am to 2.45 pm, count on the presence of some students in the studio, on experimental demonstrations, and on the use of illustrative and didactic material, as well as the use of a textbook distributed in the different centres. This course reveals to be a precious resource also for the training of the teachers.

[203] *Non è mai troppo tardi.* The programme starts out on 15th November 1960 and goes on air on early evening in order to allow the workers to watch it daily from Monday to Friday. The programme counted 484 episodes until 1968.

[204] *Non è mai troppo tardi* gained a transnational success. The programme was in fact imitated in 72 countries and received several international recognitions. The involvement of Manzi as educator witnesses the continuous pedagogic and didactic research meant to improve the quality of education starting from the most troublesome subjects, the ones who live far away from school or have been refused by it.

Telescuola and *Non è mai troppo tardi* are the forerunners of the rising, shortly thereafter, "Department Education School" (DSE). Although it is not properly the case of scientific popularisation, it can be said that both the programmes give a fundamental contribution for the diffusion of knowledge through TV.

Quarta Dimensione. Viaggi nel Tempo e nello Spazio[205], edited by Aurelio Robotti and realised with the collaboration of the International Electronic and Nuclear Review, is presented by an anchor-man in the studio who introduces the topics and promotes a suggestive atmosphere. The twelve parts into which the programme is divided, chronologically explain the most important discoveries and realisations of man over history. The themes are illustrated through videos and drawings. Compared to other features of that time, *Quarta dimensione* makes use of musical commentary to create a particular atmosphere, and expose the different geological eras lightly touching the science fiction without detaching from the scientific truth. Inside the studio, a "time machine" consents to date every organic find going back to 60.000 years ago, thanks to the radiations emanated by the carbon-14. This device, together with detailed landscape reconstructions, animations of glaciations and dinosaurs fights, up to the videos of "electronic brains in function", provoke an impressive "fascination" on the viewers. It is the first step towards the ideation of a scientific programme where the footages take the place of the expert (still present in *Avventure della scienza* and *La macchina per vivere*), having the merit of lightening the sense of permanent schooling and choosing realistic images as guarantee of truthfulness of the contents.

3.2.2 The Sixties

In the sixties two main factors are responsible for the widening and the development of the popularising programmes. First, a general improvement of economical and social conditions, encourages a capillary diffusion of television. Italians commence to consider TV as an essential domestic appliance within their

[205] On the air form 1st June 1958.

houses. Second, the schedule of Rai Due consents Italian television to undertake new challenges and experimentations. While the first channel maintains a pedagogic attitude filtered by Catholicism (the scientific programmes rarely obtain the prime-time), the manner in which Rai Due presents its broadcasts is more lay and scientific, demonstrating a strong interest in science and displaying it on prime-time too.

> «Through these programmes TV does not limit itself to convey knowledge but means to build a deal (an equal deal, based on complicity or on the discrepancy between the one who holds the knowledge and who makes use of it) with the spectator, defining somehow the subject of the statement (as educator, informant, announcer) and elaborating a well determined idea of science, idealistic or probabilistic.» [206]

Italia Nucleare[207] shows the laboratories and the Italian institutes of atomic research centres. The programme is characterised by a positivist approach on the matter regarding nuclear energy, whose peaceful potentialities are explained, together with their application to the pharmacological and agricultural field. The images are entirely realised in outdoor location shots and commented by a voice-over integrated by interviews to experts. *Atomo pratico*[208]*,* can be considered the continuation of *Italia nucleare*. In this case too Repossi explores the potentialities of the peaceful applications of nuclear energy when applied for peaceful purposes. A voice-over commenting the videos illustrates in every episode a specific topic. The style is given by a mainly documentaristic structure, rich in footages to lighten the explanation and to favour the attention, and by a simple but accurate comment. The spectator is caught by the flow of images.

A broadcast essentially based on videos and graphics where there is no presenter is ***Storia della Bomba Atomica***[209]. A voice-over comments the images alternating short sounded documentaries to interviews to well-recognised atomic physicists.

---

[206] Grasso, 1998, p. 738.

[207] Broadcasted from 3rd January 1961 every Tuesday at 10.10 pm.

[208] Broadcasted from 25th February 1964 every Tuesday at 10.40 pm. Its six episodes were entitled: *Occhi radioattivi per le industrie, Radiografie industriali, Il contadino dell'era atomica, Medicina nucleare, Città atomica.*

[209] By Giorgio Sabel. On the air from 15th February 1963 every Friday at 9.15 pm.

Information and documentation is clearly and accurately provided, by contextualising every scientific discovery according to the historical period it occurred. Compared to the style of *Italia Nucleare*, this programme is organised according to the inquiry typology; the objective account is based almost exclusively on interviews and direct testimonials, as to underline the need of objectivity and adherence to facts.[210]

During the sixties are introduced innovative stylistic criteria also concerning the construction of the programme and the typology of the video. In ***Almanacco di storia, scienze e varia umanità***[211], which intends to tell the story of civilisation through the characters who significantly marked its development, a brief cover introduces three or four reports retracing important discoveries, achievements in medicine or the biographies of scientists and explorers. The images are followed by a clear and divulging language. The programme, divided into four parts, explores specific themes. These four moments are not interrelated and the surprising element plays a determinant role in order to keep the watcher hooked up the screen. *Almanacco* counts on researchers and professors who elevate the programme to a scientific level, rather than confining it to a simply entertaining transmission.

> «The criteria that behind an apparent casualness has oriented the choice of topics [...] is privileging all the themes that can better serve to evoke the meaning of the human adventure on Earth: this chain of mistakes and successes, experiences of an instant from a whatever corner of earth that come to be a common patrimony along the very long race of history.»[212]

In ***Orizzonti della Scienza e della Tecnica***[213] the task is to bring the public up to date about the recent news of the scientific research with themes strictly linked to the actuality. There are also exclusive reports as surgery operations or interviews to widely known scientists. Over the years, have been realised monographic episodes dedicated to a single theme of special interest, and magazines where short videos on different topics are joined in studio by the presenter. These latter usually

[210] Cf. Grasso, 1988, p. 82.

[211] By Giuseppe Lisi and Giovanni Slavi, on the air from 7th February 1963 every Thursday at 9.05 pm.

[212] *Radiocorriere 3-8-1966*.

[213] Broadcasted from 30 January 1966. Edited by Giulio Macchi. The programme is televised until 1973.

underline communication problems between the area of scientific research and daily life. As a bridge that could get into contact these two worlds, the reports were edited alternating interviews to common people to opinions and comments by the experts of the matter.
In monographic episodes too, the presenter tries to mediate through the talk between the scientist and the viewer. Sometimes the reports proposed want to represent authentic scoops, relegating the programme in to the actuality and giving the impression of being always abreast of the last scientific novelty. It is then outlined a double attitude: on one hand the understandability of the content discussed and on the other one the tendency to sensationalism, even if without overly stressing the spectacularisation.

One of the first example of the big television cycle dedicated to science is ***Sapere,***[214] a didactic programme edited by Giovan Battista Zorzoli, which wants to offer the adult public a service of permanent scientific education. It is not the case of pre-packaged notions, dropped the way they are; it rather represents an incentive to a collective and critical participation.[215] Every day a topic linked to a monographic theme often concerning physics, maths or astronomy, marks the rhythm of the programme according to a strict scheme perfectly coherent with the pedagogic aims of the different cycles. The scientific topic explored from an anthropocentric perspective, becomes means of emancipation for a public as large as possible. The final goal is to offer a kind of education free from sensationalisms, a search for causes and effects about the recent scientific facts.

To close this frame on the scientific popularising programmes of the sixties we need to mention ***Verso il Futuro***[216]. It deals with scientific themes particularly fascinating: artificial body, the frontiers of life, brain complexity and the existence of other forms of life in the universe. The programme is divided into two parts: the first one alternates interviews to scientists to images commented by a voice-over; in the second part three fixed guests (a scientist, a theologian and a philosopher) and a

[214] In the palimpsest from 1967 to 1971 at 7.15 pm.
[215] Giuseppe Bocconetti, La cultura illustrata, Radiocorriere, 23rd March 1971, (cit in Grasso, 1998, p. 209).
[216] By Emilio Sanna and Andrea Barbato. Four episodes broadcasted from 16th January 1969.

fourth one changing depending to the topic, animate a round table conducted by Andrea Barbato. Each participant can expose in few minutes his own argumentation while the host first limits himself to lead the debate and he ultimately recomposes the different points of view. The clearness of the exposition and the quiet tone allow an easy facilitated approach to the programme: the watcher is placidly led into the meanders of the themes exposed.

3.2.3 The Seventies

The Seventies know a significant increase of interest in scientific popularisation thanks to several events worldly relevant. The conquest of the space and the first heart transplants arise a particular enthusiasm that favours the birth of new television programmes. Moreover, in 1969, makes his début on TV one of the most important scientific communicator of Italian television: Piero Angela. Since his first programmes (*Il futuro nello spazio, Destinazione uomo, Scienza e sviluppo tecnologico*) the way this journalist hosts the broadcast is characterised by a high divulging ability, whose reassuring tone and positivist approach concur to create a deep trustful relation with the public.

Among the most relevant programmes of the early Seventies particularly important are the ones linked to medical-health themes. In 1970 starts out ***Medicina Oggi***[217], first experiment of medical popularisation on Italian TV. Its task, more focused on informing rather than teaching, is to provide a medical update. The success of this programme is indeed due to its capacity to deal with the little problems the spectators meet in their daily life. The theoretical explanations of the specialists are alternated by footages of surgical interventions and by dialogues on specific themes between surgeons and patients.

> «The scientific rigour does not prevent from the effort for a higher degree of simplicity, although the understanding may result difficult for the profanes due to the use of a specialist

[217] Aired in third-time every Thursday on Rai Due.

language and the lack of clarifying examples; a certain degree of dynamism compensates however for the monotonous communication.»[218]

Together with *Medicina Oggi,* ***Check up***[219], started in 1977, is a programme consisting of videos and clear explanations by an "international scientific committee". The intent is to encourage the formation of a "health awareness". Alternating accounts by experts, ill people and doctors, it tries to give the public the possibility to better know symptoms and problems generated by the most common diseases. The programme touches indeed the most diffused diseases and their relative prevention and healing procedures, so that it contributes to a wide circulation of medical information. The success is guaranteed: between the public and this kind of programme the bond tends always to be morbid, at least for the perverse pleasure of making an auto-diagnosis.[220]

Besides the cases I mentioned above and the continuation of the programmes started one decade earlier, two more divulging programmes affirm themselves in the seventies by virtue of structural and stylistic innovations: ***Habitat, un Ambiente per l'Uomo***[221], and ***Boomerang, Ricerca in due Sere***[222].
The first one proposes to sensitise the public on concrete matters such as the safeguard of the artistic, cultural and natural heritage and consists of interviews to experts interwoven with documentaristic videos commented by a voice-over. These footages, core of the programme, are analysed and commented in studio by experts and Giulio Macchi himself who tries to point out the data emerged in the videos. The following cycles of the broadcast will confirm its baseline, stressing the intention of making the facts speak more than anything else, through filmed documentation.[223]

---

[218] Grasso, 1998, p. 217.

[219] On the air form 29th January on Rai Uno.

[220] Grasso, 1998, p. 297.

[221] Aired from 30th March from 1970 to 1978.

[222] It débuts on 11th June 1970 on second-time after one of the most successful programme in the history of Italian television, *Rischiatutto*. The broadcast was divided into two series, aired on Thursday and on Friday. It made use of the collaboration of some journalists, among which Corrado Stajano, Luciano Doddoli, Corrado Augias, and of film directors such as Ermanno Olmi and Ugo Gregoretti.

[223] A. Grasso, 1998, p. 216.

The second programme is *Boomerang, ricerca in due sere* and, as announced by the title, consists of two parts transmitted in the evening: in the first one the theme is presented and explored while in the second, with the intervention of journalists, guests and experts, the debate takes place inside the studio. Its aim is to establish an open dialogue with the public, in order to provide different solutions to a specific matter. From three thematic areas develop the different topics: the historical-humanistic one, the scientific one and one concerning current events.

3.2.4 The Eighties

Since the end of the Seventies but even more in the early Eighties there has been a progressive change within the television scenery and offer. It has been a radical change concerning the palimpsest structure, genres of programmes, rhythms and times. The advent of what Umberto Eco defines *Neotelevision*[224] marks the passage of Italian television from the phase of '*state pedagogism'* to the one of '*mercantile auto-reflexivity'*. The Neotelevision is no longer a "teacher" that from the above of its technological authority has something to teach, but it approaches the public in a more accomplice and convivial way. This new way of making television is determined by several factors:

1. **The advent of private televisions** and their rapid encompassing of the local and provincial dimension to reach national proportions. The private televisions bring along a stock of advertising and American products (films, TV films and soap-operas) with which the state TV is compelled to confront.

> « The private television did not certainly limit itself to transmit hundreds films on prime-time. For TV films have a serious imperfection, they all differ from each other and they are not able to build a bond based on loyalty, that is the assiduity of the viewer

[224] Umberto Eco introduces the term *Neotelevision* for the first time in an article published on the magazine "L'Espresso" in 1983, with the title "TV, the lost transparency". Already in the Seventies, however, some American television critics had seen in specific characteristics a new way of making television, free from the rule hitherto valid and effective.

to the appointments that are offered. It has then recurred to the products of serial fiction coming from the USA (and soon from Latin America too), which are widely available (also because Rai channels make scarcely use of them), already predisposed for the advertising interruptions and available in dozens of episodes.»[225]

The birth of local televisions, with the consequent proliferation of the offer modifies in depth the habits of the tele-public. With the end of the monopoly and the advent of private televisions, the univocal homogeneity that once characterised the mass-society is now fragmented: the public can autonomously create its own consumption strategies. The simple television watcher, accustomed to be subjected to a single offer, becomes a Television consumer, being finally able to choose according to his/her own tastes and interests.

«The proliferation of stations and the consequent enlargement of the offer in terms of hours and programmes, transforms the screen into an instrumental good to which is required a series of specific services called to respond to different needs and expectations, heightening the average quality of the demand.»[226]

2. **The explosion of the advertising offer.** The advertising becomes the connection between programmes, furnishing the continuous flow of Neotelevision with a sort of structure. The interruptions mark the rhythms of the programmes. The concept of Neotelevision implies a plurality of competitive channels of mainly private-commercial nature with the proliferation of the most disparate methods and instruments. For advertising reasons it becomes fundamental to know specific data about the audience and it is therefore instituted the Auditel.[227]

[225] Menduni, 2002 p. 82.

[226] Anania, 1997, p. 117.

[227] The first Auditel survey dates 7th December 1986. It still now represents the institute for the certification of the television audience and for the determination, by a convention widely accepted, of the extent and of the characteristics of the audience, therefore of the value of spaces, programmes and television characters.

> «The private-commercial character refers to the use of ratings and viewing figures[228] for the collection of advertising; this enters the palimpsest as autonomous spot (parasitical, compared to another "guest" text, which is interrupted to be continued after the insertion), as announcement of sponsorship (internal or external to the text advertised), or directly as spectacular text (programme focused on a product that plays as protagonist rather than being internal sponsor). This marks the end of the state monopoly, which is substituted by the democracy of free market.»[229]

3. **The Rai reform of 1975.** It marks the passage of the control functions from the Parliament to the Government. Since that moment Rai channels are parcelled out, namely they are spilt up between the majority and the opposition. In this way the three Rai channels end up to have as points of reference the political parties and to be in competition with one another.

4. **The developments of technologies and the media-market.** A remarkable increase of the presence of television in the houses of Italians coincides with the extension of programmes duration and with the enlargement of the palimpsest to the whole day. This phenomenon deeply modifies the habits of people: if before television was exclusively an instrument of social aggregation during night time, from the Eighties it becomes an indispensable company for housewives, retired people and children, who start to spend many hours in front of the screen. '*After sleeping and working, watching TV is the third big activity of modern man'.* [230]

5. **The multi-functionality of the tele-screen and the introduction of linkable terminals** (video-recorder, teletext, closed-circuit cameras, personal cameras).

To these aspects it has also to be added the convergence occurring in different artistic fields. In the Eighties cinema, theatre and fashion are object of contamination and hybridisation within the 'post-modern' scenery where the

[228] It has always been difficult to distinguish between audience ratings and viewing figures "If there was an effective correlation between viewing figures of the programmes and their audience data, the most appreciated programme should be also the most viewed one. Indeed, almost everywhere in Europe, the viewing figures do not find any correspondence in the data about audience, therefore they are only used as qualitative standard". (F. Casetti, F. Di Chio, 1996, p. 94).

[229] Bruno, 1994, p. 48-49.

[230] Grasso, 2000.

Neotelevision actively participates with its new way of communicating. It is an epidemic and energetic model, basically due to the need to captivate an increasingly larger target range; this is the direct consequence of the sale of advertising spaces within the palimpsest.
If the "Paleotelevision" was limited to transmit contents, the Neotelevision is involved in building social relations: the channel dominates the message and the contact function becomes predominant above all. The prevailing genre of this new way of making television is the entertainment, which does not simply refer to the amusement, but it represents a container within which the programme draws also from the register of pain and fear, aiming to touch all the keys of human feeling.[231]

It comes then to an end the television period that found in science an inexhaustible source of themes and it starts the time of a palimpsest based and marked by container-programmes, quizzes and news.[232] The schedule gains a strategic value since different stations struggle to grab the largest number of viewers as possible. For this reason, the organisation of the programmes is set in a continuous flow where multiple environments, voices and faces, are kept together by narration and music.

> «Starting from the Eighties, the palimpsest becomes a canonical scheme for the definition of the time slots (anti-meridian, afternoon hours, early evening, prime-time, second-time) and it progressively assumes the form of flow: it becomes more and more frequent the use of container-programmes, which give continuity to the vertical programming advertising itself comes to represent a sort of humus, a background upon which are located the different transmissions.»[233]

[231] An example in this sense was, in 1981, the transmission of a news item that marked forever Italian television. The death of Alberto Rampi, a child fallen into a well in Vermicino, brought to the fore a way of communicating without filters, shading light directly on the news item. In that moment dropped the barriers of decency and respect. A tragic event becomes matter of morbid sensationalism.

[232] Neotelevision blurs the boundary between information and fiction, making it blended and indistinct. It originates in this period the infotainment, neologism that underlines the forced spectacularisation of information in order to keep alive the interest of the viewer. TV needs to dramatise and narratise, constructing on a spectacular level any kind of reality it means to analyse.

[233] Grasso, 2000, p. 825.

Moreover Neotelevision is characterised for being often a media-television, crossed by an inexorable self-referring impetus. From this new television model originate programmes characterised by a strong auto-reflexivity enacted through the mise-en-scene of some technical instruments: the framing camera, the technician, the gaffes during the rehearsal and the programmed applause.

> «The main feature of Neotv is that it talks less and less (as the 'Paleotelevision' used to do or pretended to) about the external world. It talks instead about itself and about the contact that it is about to establish with its public. No matter what it actually may say or talk about. [...] In order to survive, it tries to entertain the spectator by telling him: I am here, I am myself and I am you.» [234]

In this panorama, the scientific popularisation is compelled to re-formulate its presence on television. The old divulging and pedagogic intent of scientific programmes has to be re-modulated into a neo-positivist message whose first supporter is Piero Angela. In his ***Nel cosmo alla ricerca della vita***,[235] Angela displays through nine documentaries the stages of the long path of planet Earth, from the formation of life to the one of intelligence. The contributes are mainly realised by NASA, which is involved in the first steps of the project SETI (Search for Extra-terrestrial Intelligences) and based on the research of possible radio-stellar signals and intelligent beings coming form the space. However, it is with the programme ***Quark***[236] that Angela becomes the undisputed leader of audio-visual popularisation in Italy. With his elegant and affable manners, this journalist places science among the most followed programmes of the palimpsest, arriving to touch eight millions viewers. His escalation in terms of popularity is from that moment relentless.

On the strength of his simple and at the same time flawless language, informal in his posture, wearing elegant and sportive clothes, Piero Angela obtains the prime-time in RAI starting from the fifth edition. The force of *Quark* is to propose

[234] Eco, 1983, p. 163.

[235] Aired on Rai Uno from 1980.

[236] Transmitted from 18th March 1981 on Rai Uno. Over the years it has become longer and it has been renamed *Superquark*. It is the longest scientific programme and the most successful one of Italian television.

different topics in a simple and catchy way, being also able to maintain the didactic attitude belonging to the Italian television tradition. The original formula consisted of three, maximum four reports on even very different disciplinary areas, but always brilliantly linked each other by the presenter. Angela often recurs to oversimplifications, guaranteeing this way a better understanding for the neophytes and offering a possibility of updating for the specialists.[237]

> « Quark repeats and amplifies, the "Cutolo effect": its host, Piero Angela, assumes the role of a soothing expert who believes possible the understanding of the natural scientific laws. The programme however recurs also to experts, science is emphasised as a key for human emancipation and are progressively developed narrative modalities increasingly shaped by a television style (videos, special effects in the studio, up to the virtual studio).»[238]

Quark marks a kind of Tv popularisation characterised by a technical-scientific feature rather than humanistic. This programme transcends the usual "season" and offers some extensions of the programming in the summer too, with ***Quark speciale***, where Angela works as a weaver of the different reports. Piero Angela comes to represent the putative father of popularisation on TV, the guide for young and adult people to discover the surrounding world.

3.2.5 The Private TV

The birth of private TV is one of the episodes characterising the passage from an old way of making TV to the advent of Neotelevision. With the explosion of free TV starting form the seventies it begins a process of national concentration of private broadcasting. The main Italian editors throw themselves into this enterprise, constituting, between 1979 and 1980, national networks. In succession: Pin (First Independent Channel), owned by Rizzoli; Italia Uno, managed by Rusconi; Retequattro, owned by Mondadori Group, while the builder Silvio Berlusconi buys the frequencies in order to assure the signal of his Canale 5 the coverage of the

[237] From 18th March 1981 the programme *Quark* introduces videos from BBC, whose content, over the years (from *Il mondo di Quark* to *Quark in pillole*), focuses more on zoology and ethology, arriving to take the major part of the programme, if not all of it.

[238] Grasso, 2000, p. 738.

entire national territory. In short, while Rizzoli is overwhelmed by the scandal of the masonic lodge P2 and is forced to close his station, Rusconi and Mondadori sell their channels to Berlusconi, who starting from 1984 owns the national television networks and a larger advertisement market share than RAI (with 40% audience).[239]
It raises then *duopolio*, that is a tele-offer held by three public channels (RAI) and by three private ones (Fininvest).

In this panorama, the commercial networks have no interest or duty to accomplish services tasks. Always watchful to the loyalty of their public, the commercial TV supports a deeper awareness of the audio-visual language by the public, which asks for images and videos of good aesthetic quality and catchy communicative formulas. Through the dramatisation of the scientific contexts, a deeper characterisation of expert and presenter and thematic video of high quality commented in the studio, private networks offer popularising programmes too.

> "The rules of the game are clear: the commercial TV, unlike all other industries, is not on the market for selling its own products or the ones it buys to work on. The commercial TV sells audience. That is public, tele-spectators. Therefore the programming has to guarantee a considerable audience in order to offer the potential advertisers a sufficient visibility to their products." [240]

From 1985 Canale 5 presents ***Big Bang, lo spettacolo della vita***[241]*,* a response to the programmes of Piero Angela. It is hosted by Jas Gawronsky and emulates *Quark*, although its intent is markedly spectacular. The videos have often an heterogeneous provenance, going from outdoor location shots to laboratories shots, while the presence in studio of Gawronsky represents a constant, sitting in futuristic armchairs, he deepens and links the inserts that are aired. The analysis of the programme clarifies how it is more about the news and the show rather than science, here used as mere container. What is stressed is the technological

[239] Menduni, 2004, p. 97.
[240] Giovannelli, 2003, p. 108.
[241] Proposed on second-time, rerunning on Saturday afternoon, this programme deals with different scientific topics.

application, it is evident the desire to surprise the public, the emphasis on progress and the future prophecies. This can be defined as 'scientific entertainment', which permeates the logic of the entire programme.

After an initial introduction of the programme, designed to list videos and topics, the advert breaks divide it into three parts. During the 35 minutes of programme, each of the three section deals with a specific topic, divulged by different methods, not always referable to alternative unique sources. The videos are indeed characterised by their heterogeneous provenance and style: animated drawings, sequences at the microscope and inner shots, cohabit with outdoor location shots and surveys. A mixture that alternates the "returns" into the studio through slow intertwined fadings that perpetuate the presence of Jas Gawronski in the video itself. The presenter in studio is filmed by three cameras to confer dynamism.[242]

3.2.6 The Nineties and the New Millenium

During the decade 1990 – 2000, in USA as in Europe, it has been laid the foundation of a profound transformation of television on three levels: one regarding offer and contents, an economical-financial one and a technological one. The local components of TV are rediscovered, while emerge the supra-national, wiping out that national and linguistic field that has always seemed to be the most typical of television, especially in Europe.[243]

> «The Nineties mark a revolution of contents, which have been developing towards the so called "TV-verité", passing through service television and trash TV, up to the explosion of the appreciation of the reality shows. Courtrooms brought into the small screen, feelings and love stories showed off blurring the border between public and private. At last the display of cameras and back stages, quarrels and courtships. A general flattening of contents has embraced the contextual multiplication of genres.»[244]

[242] For a detailed analysis of the programme see Grasso, 1998, p. 163.

[243] Menduni, 2002, p. 187.

[244] Tomassini, 2011, p. 25.

3. From Pedagogic TV to Web-Video

During the Nineties, Rai continues to guarantee the most part of scientific programmes. The interest of Fininvest networks (now Mediaset) and of other small satellite networks, is more oriented towards programmes such as quizzes and talk shows, which assure more audience. Moreover, in these years of well-being and entertainment at any cost, it is inevitable that the medium that par excellence enters the houses, converts its own offer, dismissing its pedagogic task to play as entertainer.

The most part of the divulging role is absorbed by programmes focused on medicine. This is the time of *Medicina 33*, *Visita medica*, *Più sani più belli*, *Il medico in diretta*, *Quando c'è la salute*, *Un milione di ore, Istruzioni per vivere 100 anni*. The programmes dealing with physics nearly disappear, being relegated to the DSE schedule (Department School Education), due to the need of a more academic language. On Rai channels, on prime-time are offered two appealing programmes: *La grande storia* and *Quark*.
In these years make an entrance new anchor-men involved in popularisation, who on the wake of Piero Angela try to personalise and give their own original contribute to the programme and to the way of popularising science on TV. The most important are Licia Colò, Ambrogio Fogar and Giorgio Celli, who respectively relate to a friendly and recognisable style, to the image of the adventurous man and to the figure of the scholar.

On the private networks are aired, among others, ***La macchina del tempo***, ***Jonathan Reportage***, ***L'arca di Noè*** and ***Visita medica***. They are often contaminated by sponsorships that orientate the attitude of the programme itself.

La macchina del tempo[245], uses precious scientific documentaries and often enriches the programme with monographic episodes dedicated to themes of actuality. Compared to the "lay and positivist" perspective on science of Piero Angela, by which the spectator has the impression to learn always something new,

[245] On the air from 11th March 1997 on Mediaset networks, it is hosted by Alessandro Cecchi Paone.

in the programme by Paone the offer is wider and the themes proposed tend to leave shadows of misterery.
After four editions, the hegemony of Piero Angela begins to totter since Cecchi Paone manages to impose his own style. This journalist avoids convincing scientific analyses and is deeply interested in fiction and in spectacular features.[246]

Jonathan Reportage[247] is a programme by Ambrogio Fogar where the explorer-presenter travels the world with his troupe, producing images of remarkable interest and running extreme risks. This programme is the demonstration of Fogar achievements and represents a useful source of documentation about barely known and extremely fascinating areas.
Also the programme ***Arca di Noè*** (to which will follow ***Alle falde del Kilimangiaro***) offers a view on distant worlds, often astonishing for their natural beauties. The anchorwoman in studio is Licia Colò, who serves as trait d'union of the documentaries displayed.

[246] Grasso, 1998, p. 633.
[247] On the air on Italia 1 channel from 27th April at 2.30 pm.

3.3 The Different Forms of Scientific Popularisation on TV

After having analysed the evolution of popularisation on Italian TV over the last decades, it is now interesting to draw the attention to the current offer, which, as we have seen, over the years has been notably widened and stratified. Today, with the advent of digital TV and the consequent multiplication of channels (lots of them are thematic), there is a large number of programmes dealing with scientific topics. Within this universe it is useful to know which are the main formulas used by the presenter from the perspective of the audio-visual language and style. After over 50 years since the birth of television, understanding which programmes of the past have been used as models and integrated with new technologies and rhythms, provide us with an updated portrait of how the audio-visual language is used today to communicate science on TV.

By screening the current Italian television system, before to deal with the new forms of contamination between digital television and the Internet, I have detected and analysed seven typologies of programmes characterising the generalist television. The analysis springs from a definition elaborated by Paolo Braga[248], who traces a portrait of television popularisation choosing as first reference the way the programme is hosted. After pointing out to the role played by the presenter in shaping spaces and rhythms of the programme, the author resumes the range of the main programmes into two models: the *soothing model* and the *tension model*. A third model needs to be added to these: the *indirect model*, which includes series dealing with scientific matters transposed into fiction (for instance C.S.I., E.R., Numbers, etc.)

3.3.1 The Shooting Model

This is the model where the communication of scientific contents is placid, supported by a positivist perspective and the spectacularisations are useful only if

[248] The analysis originates from a definition given by Paolo Braga in his: *La divulgazione scientifica in televisione* in *Le logiche della televisione*, Franco Angeli, Milano 2004.

directed to deepen the massage conveyed. There is a minimising tranquillity, a nearly amused participation to the predictable surprise of the public the simplicity of the resolving principles derived from the matters explored.[249]

> «The scientific cause does not need introductions or defences: it talks about itself, the presenter is at the same time his handmaid and ambassador, respectful of the limits imposed by the divulging diplomacy. He is a teacher fulfilled by his knowledge and on the strength of his honest preparation in the matter, holds sincerely out his hand to the viewer and does not take offence if he refuses it.»

Quark (and *La macchina meravigliosa*), *Ulisse*, *Medicina 33*, *Sfera* belong to this model. The communicator who par excellence embodies these characteristics is Piero Angela.

- The Enthusiast of Discipline: *Quark*

Piero Angela is one of the most important scientific communicator of Italian television. His great ability to deal with even complex topics led him over the years to realise numerous episodes that explored disparate scientific matters. *Quark* and *La macchina meravigliosa*[250] are emblematic examples where the presenter takes the viewer's hand for a trip into knowledge. The way of presenting is characterised by sober tones and by an expositive rhythm without jolts or dramatic peaks. The stress exclusively involves the information, handled with simplicity and at times enjoyment. In this sense, the scientific research appears in terms of a human collective enterprise, where the host resumes and connects the concepts emerged in the videos. The ability of Angela is indeed to propose himself at the same time as competent and curious to discover the novelties. From his/her part the spectator is free to choose the degree of involvement and attention to devote to the contents offered.

[249] Braga, 2004, p. 199.

[250] *La Macchina Meravigliosa* was divided into different parts that Rai inserted into the didactic project "Mosaico".

- Cascading Information: ***Sfera***.

This programme is a container that after a début guaranteeing a high degree service, introduces a series of audio-visual inserts, usually produced in USA, which lead to a progressive degradation of the scientific level of the videos. From reports regarding the last medical discoveries or important archaeological finds, the programme shortly changes over documents on roads disasters, caving-in buildings and miraculous rescues, which have nothing to do with science. In this case it appeals to the sensational event. The style of the presenter is naive, apt to create a sense of familiarity with the public. His interventions are only short introductions to the report and there is no room for analyses and in depth-examination in studio.

> «It is packaged something between suggestion and news, while who is watching accrue the comforting certainty that planetary scientists and experts are struggling for solving the problems of everybody: it is good then, let them work»[251]

- The Journalistic Style: *Check Up* and *Medicina 33*.

In this type of programme the divulging is based on a rigorous professional ethics. What matters here is the concision and the accuracy of the questions addressed to the experts, there is no room for any kind of personalisation or for attempts of humanisation by the anchor-man. It is then evident that the spectacularisation is here totally absent, in behalf of a service offering the citizen useful information. In these programmes then there is no debate, the atmosphere is aseptic and serious and the account in a specific field is integrated with an update about the novelties and the recent discoveries. *Medicina 33* and *Check Up* are two emblematic programmes of this model.

- The Humanising Popularisation: *Elisir*.

Unlike the previous cases, this programme develops part of the analysis and in-depth analyses inside the studio. The host, bearing an acknowledged humanistic culture, approaches the events exposed with curiosity and naturalness. His task is to build a clarifying bridge between the concepts outlined by doctors and scientists and the viewers. Despite not being a specialist of the medical field, he handles the

[251] Braga, 2004, p. 200.

topics directly and pragmatically, asking simple but useful questions and disclosing details that otherwise would passed unnoticed. The informal talk contributes to create an atmosphere where medical science assumes the tones of confidential paternalism. Michele Mirabella has experimented this formula in his programme *Elisir*, televised on Rai Tre.

3.3.2 The Tension Model

The divulging task is imbued with a militant style meant to involve and keep a sort of suspense. The presenter takes active part to experiments and experiences on the field, showing an often self-referential attitude characterised by an explicit need to be the centre of attention. The spectacularisation is boasted and it often becomes more important than the themes at stake. Belong to this model: *Voyager* (and *Stargate*), *Gaia il pianeta che vive* and *La macchina del tempo*.

- The Evocative Style: *Voyager* and *Stargate*.

The programme is based on the misters that science has not been able to completely disclose yet. We are then on the border of scientific knowledge, hanging on the balance of that abyss of mystery and unknown that fosters the attention of the public.

«The exhumation of what is unsolved and the morbid predilection for the search of the hidden motives behind events or human actions, avail themselves of the label of popularisation in order to anaesthetise the critical sense of the viewer preventing him/her from feeling guilty. Cabalistic and seafaring symbols, heavenly cartographies and darkened maps of the world render desirable the thematic continuity of archaeology, biography and alchemy.»[252]

- The Enthusiastic Style – *Gaia, il pianeta che vive* and *Alle falde del Kilimangiaro*.

Science becomes a means by which to observe the natural wonders. By analyses and interventions on the field, the presenter shows particular events or exceptional

[252] Braga, 2004, p. 202.

microcosms. This is the case of a spectacularisation and exaltation would not need the use of words. The spectator is encouraged to observe what the host himself is looking at and trying to explain. When he is in the studio, the anchor-man makes use of more sober register.
The programme that embodies this model is *Gaia, il pianeta che vive* conducted by Mario Tozzi. *Alle falde del Kilimangiaro* has a similar structure and an enthusiastic attitude. In this case the anchor-woman, Licia Colò, seems to be more serene. In this case the personality and the attitude of the presenter influence the general atmosphere of the programme.

- The Popularisation in the Firing Line: *La macchina del tempo*.
La macchina del tempo[253] is a container-programme where science is fragmented into a multiplicity of documentaristic reports and a series of in-depth analyses developed by the presenter in studio. Compared to the programmes of Piero Angela (to which *La macchina del tempo* competes with), the emotional and visual experience is more stressed than the scientific communication. The presenter does not really elaborate the information, but he limits to emphasise the exceptional value of reports and documentaries proposed and bought from the archives of well-known foreign stations such as BBC, Channel 4, National Geographic, Discovery Channel. Since its first episodes (1997), *La macchina del tempo* presents itself as an avant-guard programme for its advanced use of computerised graphics and innovative style in the direction. *La macchina del tempo* is considered the response of Mediaset to the undisputed predominance of *Quark*.

3.3.3 The Indirect Model

As I have underlined with regard to the fiction-films, which base their plots on scientific topics, within the panorama of TV serials there are emblematic examples

[253] On the air from 11th March 1997 in an attempt by Mediaset networks to give a response to the popularising programmes of Piero Angela. Designed and presented by Alessandro Cecchi Paone.

of fictions linked to scientific environments. C.S.I[254], E.R.[255] and R.I.S.[256] are set in police stations, hospitals or investigational offices where the interwove of engaging plots and the use of special effects allow the viewer to come close to scarcely known professional environments nonetheless medical science and scientific inquiry represent the main professional features. This way the viewers are indirectly updated about the specific tools of detectives and doctors and can quickly learn basic notions.

This is obviously an indirect scientific popularisation, filtered through fictional events that for this reason cannot be considered a proper scientific communication. However, since it represents a widespread phenomenon, this formula has to be taken into account this formula, since, although superficial and incomplete, it creates a cultural background for TV-watchers who are otherwise not interested in science.

3.3.4 Excluded Cases

I have excluded from these examples some extremes of scientific popularisation that do not belong to the two models detected. These are *Nettuno TV* and *Sai xchè*. It is useful to mention them since they represent an example, each of them with its peculiar features, of a peculiar manner to deal with scientific knowledge. *Nettuno*

[254] *CSI: Crime Scene Investigation* (also known as CSI) is an American crime drama television series, which premiered on CBS on October 6, 2000. In the city of Las Vegas, Nevada, a team of forensic investigators are trained to solve crimes by examining the evidence. They are on the case 24/7, scouring the scene, collecting the irrefutable evidence and finding the missing pieces that will solve the mystery.

[255] *ER* is an American medical drama television series created by novelist Michael Crichton that aired on NBC from September 19, 1994 to April 2, 2009. *ER* follows the inner life of the emergency room (ER) of fictional County General Hospital in Chicago, Illinois, and various critical issues faced by the room's physicians and staff.

[256] *R.I.S. - Delitti imperfetti* is an Italian television series on air from 2005 to 2009. R.I.S. follows the adventures of 'reparto investigazioni scientifiche' situated Parma.

TV does not use at best the potentialities of television, while *Sai xchè* turns science into a pure show.

- Nettuno Tv. It represents the first Telematic and Television University in Europe that uses two satellite televisions networks, Rai Nettuno Sat1 and Rai Nettuno Sat2 for the broadcasting of classes and academic activity. The teaching, carried out by professors of traditional universities, does not take place in classrooms but within different spaces, real and virtual ones, allowing anybody to attend University with no time or space limitations. The teachers present their own subjects in front of one or two cameras, assisted most of the time by additional slides appearing behind them and that at times are displayed in the foreground by the director. In this case the potentialities of the audio-visual language are reduced to the minimum. No change of rhythm, no music and scarce recourse to graphics. The programme entirely relies on the explanation skills of the professor.

- ***Sai Xché?***[257] is based on a mixed editing where two presenters alternate to one other lavishing scientific news in pills and simulating high tension from live. The title takes inspiration from the questions of the viewers, which are listed during the summary of the programme. The answers are given by two hosts moving on the field, close to the matter under examination. The bounce between the two is rapid, interspersed with images of high spectacular content, tension music and catchy graphics. To frame the presenters-reporters who in each episode answer over twenty questions, are displayed inaccessible places, huge parks, never seen backgrounds and breath-taking immersions. Besides the original videos, shot with the conduction of Umberto Pellizzari and Barbara Gubellini, this programme uses fragments of international documentaries coming from BBC, Discovery Channel and National Geographic. Unfortunately however, though the use of high quality videos, the scientific value is always sacrificed in favour of an extreme spectacularisation.

[257] Aired on Rete 4 and presented by Umberto Pelizzari and Barbara Gubellini.

3.4 The Digital Television

So far I have elaborated a close examination of one typology of television, which by virtue of its offer, structure and contents can be defined classic. It is the model of general TV that over fifty years has dominated the Italian television market. During the last two decades however, television has gone through a slow and deep transformation. From the mid-Nineties, the conversion to digital has not only created a multiplication of productions, languages and formats, but has also generated new forms of television distribution. It is exactly from this moment that it has been started to talk about different *televisions*: the proliferation of the offer through new vehicles has generated new TV models, thus modifying the forms and conditions of consumption. With the traditional analogical TV in few years align the satellite, the digital terrestrial TV, and the IPTV, which consented the viewers to release themselves from the role of passive users and to enact a major interactivity with the media. The advent of the digital terrestrial, for example, has implied the unfolding of numerous thematic channels, while the use of IPTV and of some systems of the satellite TV (e.g. MySky), gave the viewers the chance to select, by themselves, times and modalities of access to the contents.

> «With the development of the so called digital distribution platforms, as the satellite and the digital terrestrial - which also offer a range of channels that was unthinkable only few years ago- the viewer is no longer passive: he is not "subjected" to a unique schedule but he can choose within a large offer what to watch and can also interact with the services that are offered by means of the zapper.» [258]

To the old television, continuously transmitting programmes that are part of the palimpsest, distributed by a broadcast and received at the same time by all the tuned-in viewers, adds the television coming from "below", where the participation is active, direct and non-mediated. The viewer can skip from being mere listener to author. The digital television accomplishes therefore the fracture of the traditional television and cinema model that forced to follow the contents according to a stated order, with no possibility to skip, watch again or keep the contents (all features differing hypertext). This marks a significant passage, where roles and identity of

[258] Tomassini, 2011, p. 25.

the subjects working in this field are put into question, together with the style and the language of the contents proposed.
Moreover, the convergence between TV and new digital technologies, together with the increase of wideband transmitted programmes, has not only allowed an expansion of TV offer, but also the fruition through other devices (PC and mobile devices). In the future the vision will no longer be static (home, office, bar) but in movement, through screens destined to become more and more diffused and numerous, demonstrating the enormous capacity of multiplication to which the video is destined.[259]
For these reasons and for the purposes of my analysis, after having traced a panoramic about the current variegated system of televisions, it is necessary to analyse the phenomenon of web-videos, isolating it in its multiform and constant evolution and trying to consider which are the expressive features used an usable in the field of scientific popularisation.

3.4.1 The Digital Televisions

Currently in Italy digital television broadcast (the contents are sent by a single station to all the active receivers) distinguishes three models each of which uses a specific transmitting channel. Over the years the terrestrial digital and mobile phones of third generation add to the satellite television, which has been the first to break the duopoly of analogical television, creating a valid and competitive alternative.

a. The Satellite Television

Satellite television has been the first television model from since the Nineties created in Italy an alternative to the duopoly in force from 1984 and constituted by Rai and Mediaset. It is a digital television diffused in broadcast by satellite and directly available on home devices (*Direct To Home*), receivable over the entire national territory since 1997 (when starts out the operative cycle of the satellite Hot

[259] Menduni, Catolfi, p. 133.

Bird 2 by Eutelsat), although it is starting from 1990 that the first experiments of this new television are carried out, specifically with *Telepiù*.[260] The prevailing role of this television typology is the modality *pay per view*, diffused scrambled with a *set top box*[261] owner that carries out three functions: the descrambling of the signal, its conversion into analogical when it is plugged to an old-fashioned television, the graphic interface Electronic Programme Guide with support to many functions among which the possibility to accede to the Video Recorder.[262] Since 2003, after the experiences of Telepiù and Stream, in Italy there is a single platform, Sky, which by 30th September 2011 has exceeded 5 millions subscribers.[263]

b. The Digital Terrestrial Television

The digital terrestrial television or DTT (Digital Terrestrial Television) is the terrestrial television represented in digital form, transmitted through electromagnetic waves and received through a '*Set Top Box'* that integrates the analogical televisions or the integrated decoder of modern digital televisions.

For its diffusion, Italy has decided in 2005 a forced passage through a *switch over* enacted by every single regions in different times. The first two areas concerned by

[260] In August 1990 the society *Telepiù SpA* controlled by the cartel constituted by the German Leo Kirch (45%), Vittorio Cecchi Gori (35%), Silvio Berlusconi (10%) and other minor partners, obtained three television concessions for a television platform with fee, *Telepiù*. Its transmissions started on 20th October 1990. The three channels, initially all of them in-clear (not scrambled, therefore available for free) were *TELE+1*, dedicated to cinema, *TELE+2*, dedicated to sport, and *TELE+3*, dedicated to culture and entertainment. The launching of this service with fee was preceded by a massive advertising campaign both on national networks and on the ones of Telepiù. Since at that moment there were not televisions that enforced the standard used to encrypt TV signal, in order to be able to use the paid service it was necessary to link TV to an appropriate set-top box (decoder). Telepiù provided it by loan for use after the subscription. This paid service found it difficult to take off and after 7 months of scrambled schedule the loss were close to 150 billion lire. In the spring of 1993 TELE+ continued to lose money and the partners tried to remedy through of an absolute novelty for the Italian market: in June 1993 TELE+ reached an agreement with Lega Calcio to transmit with fee and live Serie A, every Sunday at 8.30 pm and Serie B matches, every Saturday always at 8.30 pm. Although from November 1996 Telepiù starts to operate by satellite too with the new television platform Dstv, the society continues to constantly lose money. After several passages of holdings between different foreign businessman, in 2003, after the passage to the digital terrestrial, Telepiù is taken over by Sky.

[261] Il Set-top-box is a device whose only function is to scramble a video-signal.

[262] Menduni, Catolfi, p. 148.

[263] Source: www.sky.it.

the project have been Sardinia and Valle d'Aosta in 2008 and then progressively all the other Italian regions are currently actuating this passage. By the end of 2012 the entire national territory will be covered by the DDT signal. After a short period of coexistence of both the modalities, the digital terrestrial will substitute in every region the analogical television, coming to represent the only in-clear offer at disposal.

National Calendar (updated to Giugno 2011)[264]

2008	II sem	Area 16 - Sardinia
2009	I sem	Area 2 - Valle d'Aosta
	II sem	Area 1 - Western Piedmont Area 4 - Trentino and Alto Adige Area 12 - Latium Area 13 - Campania
2010	I sem	Area 3 - Eastern Piedmont and Lombardy
	II sem	Area 5 - Emilia Romagna Area 6 - Veneto Area 7 - Friuli Venezia Giulia Area 8 - Liguria
2011	II sem	Area 8 Liguria

[264] Source: www.digitaleterrestre.it.

		Area 9 - Tuscany and Umbria Area 10 - Marches Area 119 - Abruzzo and Molise
2012	I sem	Area 14 - Basilicata and Apulia Area 15 - Sicily and Calabria

The passage to DTT has been presented as the possibility for the viewers to have at disposal interactive services, commercial ones as well as services furnished by public administration and as the possibility for local stations to grow. To this day however, the advent of DTT seems to be quite successful in the *pay per view* diffusion of football matches or films in prime vision, transmitted by the platforms *Mediaset Premium* and *La7 Carta Più*.
The most immediate effect of the new technology has been the proliferation of channels available to the users: four digital channels for each analogical one, namely one station guarantees four channels. This wider offer has also multiplied the programmes typologies.

c. TV on Mobile Devices

The third generation of mobile phones (UMTS)[265] consents the television reception through a technology called DVB-H[266] (Digital Video Broadcasting Handheld). The reception is on broadcast mode as a normal television and it is not to be

[265] Umts is the Universal Mobile Telecommunication System. Technology of third generation mobile phones that enables to send multimedia messages, make videocalls and quickly connect to the Internet.

[266] The DVB-H (Digital Video Broadcasting Handheld) is a combination of digital video with the IP (Internet Protocol): the contents are subdivided into small packages, by using the same basic technology of the Web. The aid of IP consents the fruition of TV and radio programmes on mobile phones, as well as Web pages, music and games. It is possible to reduce the data dimension and transfer them preserving the video quality: that increases the efficiency of transmission and enables to receive from 10 to 55 channels.

confused with the handling of on line and offline multimedia contents by mobile phones.[267]

As well as cell phones, DVB-H allows the transmission of programmes on smartphones and palmtop and functions by combining the standard of digital videos with the Internet Protocol (IP), in order to divide the contents into packages of data to be transported to the devices.

Today in the Italian DVB-H market there are operators of mobile telephony Vodafone and 3 Italia, but we are living a stage of deep transformation where the operators involved are enacting a new passage from DVB-H to DTT, compromising in this sense the reception of television on mobile devices.

3.4.2 Television on the Web

Besides the three offers broadcast television listed above, there are digital televisions diffused by protocol IP through the Internet. In this case there are two diffusion forms: the IPTV and the Web-TV.

a. IPTV

The IPTV: Internet Protocol Television is a system designed to use the transport infrastructure IP to vehicle television contents in digital format through broadband Internet connection. Currently in Italy there are three IPTV offers: Fastweb TV, Telecom Italia IPTV and Infostrada TV. Three telephony operators that offer the connection to digital terrestrial channels, football matches with fee and on-demand films. This represents then a service limited to who is subscribed and provided with a particular hardware (set top box), which plugged in the television enables the reception. The main resource for the IPTVs are the subscriptions and the single products purchased by the users, to which has to be added the advertising.

[267] Menduni, Catolfi, p. 149.

b. Web-TV

The Web-TV is the television the users benefit through the Web thanks to the streaming technology. Both in-clear and with on-demand contents, there are several editors of Web-TV:

- Traditional television operators that try to extend the television offer to the Internet
- *Simulcast* television stations[268] (www.rai.tv)
- Press publishers (e.g. Gruppo Espresso)
- Small stations
- Single or small groups

The birth of these diffusion models of television signal, integrated with the new technologies, has offered new possibilities of fruition. For the audio-visual scientific popularisation, this evolution has not implied a positive effect yet, since television offer focuses on reporting and sportive programmes (football matches or international events) or relies on the entertainment assured by mainstream films, excluding the major part of divulging programmes. This marks a tendency that over time is strengthening and that in spite of the proliferation of thematic channels is leading to a very rapid change in the structure, language and duration of programmes. Scientific knowledge is increasingly packaged into "pills", referring to other channels for deeper explanations. The video fragmentation and the rapid, short and simple style recalls and adjusts to the interbreeding occurring between the digital televisions and the world of the Internet. It is within the Web that the features of a new video typology can be best observed, a video that is part of a hypertext and hypermediatic texture made out of blogs and specialised portals.

3.4.3 The Autonomous Forms of the Internet: Feed Reader Contents and Blogs

Besides live broadcasts (simulcast) and online streaming, the Internet offers the users the possibility to realise and upload original video contents on appropriate

[268] Simulcast. The same programme is simultaneously transmitted on different media by different modes of transmission (e.g. DTT and Web-Tv).

spaces of the Web. In this regard, the popularising videos meant to be uploaded on the Internet will own their own characteristics, differing from the ones so far analysed and applicable to television. If with the advent of digital television the diffusion of TV has deeply changed thanks to the opportunity the Internet has given to upload "original" videos, a new formula in the realisation and production of videos has risen. For the purposes of my analysis on the forms of audio-visuals at disposal of who is committed in popularising and conveying scientific knowledge, the web video reveals to be a new significant model to be added to the ones taken into account so far. Web-videos are integrated within specific hypermedia spaces where can be also found texts, photographs and animations. It is then useful to analyse them according to the typologies of the web pages they rely on.

The Feed Reader Contents

The fed reader contents are portals where web-videos constitute the corner stone of their structure. The progenitor of these portals is Youtube,[269] first appeared in 2005 and then bought by Google the following year, which constantly updates its offer made of videos directly generated by the common users (*User Generation Content*). Its formula is very simple: through the Web anyone can publish a video file. Once that it is posted, the footage is at disposal of all the users of the Internet who can watch it within a Web page thanks to a player realised with Adobe Flash (provided by all the main browsers). The videos, lasting up to ten minutes, are indexed and ordered into channels accessible through an inner search engine and can be embedded into the pages of any other web site.

The videos generated by the users can be directly produced by them or they can be based on pre-existing materials (films, trailers, single video-clips, and TV programmes). Due to this rapid and massive diffusion of videos, the cinema producers have initially required *Youtube* to eliminate the content shared by private

[269] With 76,4 million of users on July 2009 and an increase of 38% respect the same period in the previous year. According to the data provided by Comscore, YouTube has doubled its streams from October 2009 to March 2010. With these numbers the American market surpasses the 39% of the entire segment of online videos, but its strength and domain is due to the fragmentation of quotes of other competitors rather than its own share.

users but owned by them, in order to safeguard their rights, but they soon realised that was impossible to impose a censure and they agreed to realise personal networks on the website.

> «Since 2005, when Youtube was created, TV fragmentation has become a reality. The short videos, collected by this great multimedia collector, increasingly mark and sustain the logic of the progressive reduction of public share attributed to a single station. From the point of view of contents, the formats hardly represent an original creation.»[270]

On Youtube there are several channels that collect popularising videos. There are institutional channels, managed by television broadcasters such as RaiScienze,[271] which uploads parts of transmissions aired on terrestrial digital, or important international scientific communicators such as National Geographic[272] sharing its own documentaries.
There are also channels sharing self-produced videos. One of these is channel *Gravità Zero*[273], with a series of videos consisting of interviews, conferences and public meetings dealing with different scientific issues. The degree of elaboration of these footages is not particularly high, but they offer the possibility to watch interviews with background music, graphic and photo inserts that using the potentialities of web audio-visual, give these products dynamism and depth.

Each channel represents therefore a real audio-visual universe where the index-linked clips are benefited by the user to his liking. There is no much room for users to personalise the channels of which only colours and text can be modified. The rest of the structure, list of videos, window graphic, icons and menu, remain the same: this is the trademark of Youtube.

An other contents aggregating site, entirely focused on scientific popularisation, is TED portal (Technology, Entertainment, Design): www.ted.com. It collects conferences held by remarkable personalities on a wide range of topics: from

[270] Menduni, Catolfi, p. 84.
[271] http://www.youtube.com/user/Raiscienze.
[272] http://www.youtube.com/user/NationalGeographic.
[273] http://www.youtube.com/user/gravitazero.

technology to media, passing through science and innovation. Its archive, weekly updated, offers videos covered by *Creative Commons License*,[274] namely they can be watched and downloaded freely from the Internet. This corresponds to the main aim Ted has embraced: to spread ideas.[275]
Currently TED is considered a global community that welcomes representatives of every discipline and culture in order to look for and offer a deeper comprehension of the world, wishing that such understanding may turn into a better future for everybody.

The home page of this portal counts many links and menus where each user can surf by making a personal research according to topics, date of realisation, kind of speaker, etc. In the central part instead, windows of different dimensions according to the importance of the video show a frame of the audio-visual that can be selected, with a brief written description about the content of the talk.

[274] The Creative Commons licences offer six different articulations of copyright for artists, journalists, teachers, institutions and generally for creators who wish to widely share their works according to the model "rights reserved". The owner of the rights may also to not authorise its work to commercial uses (Non-commercial option: NC) or the creation of derived works (ND); if derived works are allowed, he can impose the duty to release them with the same licence of the original work (Share-Alike: SA). The combinations of these choices generate six CC licences, also available on Italian version. Creative Commons is a no-profit organisation. Creative Commons licences, like all our instruments, are freely accessible and gratis, with no need to contact CC for permissions or registrations (source: www.creativecommons.it).

275 Since1984 TED project gathers at Monterey, California, thinkers and creative. With the passing of time the contributions come from more and more divers fields. Someone has even defined it "the Davos of the optimists", or "a four days travel into the future". Around the initial experience of Ted Conferences, have been developed important extensions: TED Global is held every time in a different country. The first conference took place at Oxford, Great Britain, in 2005; the second one, on June 2007 at Arusha, Tanzania. The themes touched in these Global Conferences are more focused on development, but the modality is the same. The Ted Prize is aimed at gathering by TED community talents and extraordinary funding. It is assigned every year to three exceptional individuals, each of them receives 100.000 dollars and, even more important, the title of "A wish to change the world". Their wishes, revealed after months of preparations, have led to collaborative initiatives to their programmes, producing a significant impact all over the world. TED Talks has started as an attempt to diffuse all over the world what happens during the Ted Conferences. Since they have appeared on the Web, they have attracted such a large audience that it has been necessary to adapt the TED portal, so that it could offer everybody the possibility to listen to the most inspired voices.

Nearly all the videos offered, created and generated by the TED staff, focus on professors conferences, researchers or famous figures who speak in front of an audience. The style of direction is similar to TV but it is specially set when it integrates overlay slides shown by the speakers themselves. Unlike other portals of thematic videos as Yuotube, the length of TED videos has no limits and can vary from ten minutes to one hour or more.
Most of the fascination is based on the ability of the speaker, most of the time he mixes his professional achievements and failures with experiences taken from private life and generates a strong link with the listener. A simple operation but significantly useful for the international openness of this web site. As for Youtube, on TED portal the users can also give their comments to the videos and open discussions with other users, giving this way the start to interesting and constructive debates. In this case the interactivity reveals to be the most powerful tool at disposal of TED portal.[276]

Blogs and Video-Blogs

The word 'blog' originates from the contraction of 'weblog', that is 'trace on the web'. More precisely, "weblog" is a word built on two terms joint together, 'web', that is the Net, and "log", that is the software that serves to keep the trace of the accesses to a website. This phenomenon has begun to take over in USA in 2001 and quickly spread with the development of the first free services devoted to the management of the blog. The possibility to publish documents on the Internet soon evolved from being a privilege of few (universities and research centres), to represent a right extended to everybody (the bloggers, indeed), marking the passage from the first setting of the Internet to the new modality labelled Web 2.0.

The blog is then a website, independently managed, which allows to share and directly interact with other bloggers or users of the blogosphere. It is usually based on a programme of guided publishing that consents to easily create a site where to published stories, information and opinions in total autonomy. Normally publishing does not imply stated times or deadlines. It is the author who decides and often the

[276] For a detailed analysis of the characteristics of a TED web-video see chap. 4.4.

blog turns to be a diary on the Internet where collecting thoughts, without following specific schemes or rules.

Currently the blog consists of a schematic structure where to each publication (also called post, entry or message), is predisposed an entire page, dynamic or static. The interventions are generally associated with thematic categories that represent therefore one of the two most common archives. The second one is the date archive, where it is possible to surf the messages posted during a determined range of time, usually one month. The contents are generally referring to one or more blog categories and they are published according to a chronological order like the pages of a diary. The posts can contain, as well as the text, also photos, graphic and most of all videos. Nearly always these videos are also displayed by classic video portals such as Youtube and Vimeo.

Within the infinite and endless offer available in the web, I have taken into account one popularising blog in order to analyse how the video is integrated into the articulated web pages texture and how it can facilitate the transmission of scientific knowledge also through the Internet.

The case I have analysed is the one of www.gravita-zero.org, which publishes daily several post (sometimes even two or more messages are posted in one day). The *Home page* is divided into three columns. The central one, where are posted daily messages, is the largest one. The two lateral columns are instead fixed and contain structural elements of the blog. On the right column are listed few links to websites, online articles and journals. On the left column there is the index of topics that help the user to orientate and explains the aims of the blog. This set of elements serves to guarantee the reliability of the site, which presents itself as a constantly updated window on the world of scientific popularisation.

> «Gravità Zero is a blog of scientific popularisation that tries to explain science by a plain and clear way, simple and entertaining. It is structured as a corporate blog: a downright survival kit, a valid tool trying to erase that distance between the produces of science and the large public. Articles dealing with the most actual scientific researches alternate to general news and articles and with recreational and entertaining games. This blog stimulates the left hemisphere of the brain, without forgetting to stimulate the creative part assigned to the right

> part. A blog that on the one hand addresses researchers, teachers, journalists and popularisers, who will find here methods for 'communicating at best their studies'. On the other hand a blog addressing young people and passionate who will find on these pages a peculiar instrument to deepen their knowledge of the physical world under a totally innovative and stimulating perspective.»

Scrolling the central column we find mainly videos coming from *Ted* and *Youtube*: the function of these videos is to offer a support and an integration to the textual descriptions of the authors. Among the positive elements of this divulging space on the web we need to mention the daily update that offers always new contents at disposal of the users and the possibility to add videos of interviews, conferences and explanations thought to facilitate the comprehension.

The **video blog** is a specialisation of the blog, usually shorten in to **vlog**, where the main source of communication is the video. In this case the blogs can be considered in terms of autonomous television networks within which the user is free to choose which videos to watch. Often, as well as having the possibility to export a podcast, the Vlog allows the direct vision of the uploaded videos. In other words, if you want you can decide to watch the videos directly presented on the browser, using the PC. Moreover, the Vlogs make often use of the web syndication to allow the distribution of videos on the Internet through the formats RSS and Atom for the managing and the automatic aggregation on PC or mobile devices.

The true strength of the Vlogs is the simplicity by which the 'bloggers' can create their own page on the Internet and at the same time the facility of access and fruition for the Web users.
In many of these Vlogs the blogger publish videos talking about their opinions in front of a camera. These are amateur videos whose strength relies on the words of the blogger. However there is also a nourished category of Vlogs we could define "professional" or "semi-professional", made by experts, passionate people or professionists and generally focused on a specific theme. This is the most influential blog category and the most read one, containing also Vlogs dispensing scientific popularisation.

3.4.4 Characteristics of UCG and Future Perspectives

From what I have described so far emerge some specific stylistic elements characterising the Web-videos uploaded on the web by the users, videos that do not come from television, cinematographic or documentary productions (that is, they are not a re-proposal of filmed documents already aired on other platforms).
These videos are realised and posted by the users (User Generation Content) on an independent and autonomous space. From a broadcast communication (from one to several ones) to a direct multiple transmission where interactivity represents the main novelty. As we have seen in relation to portals such as Youtube and TED, the possibility to comment the videos displayed or to give a response by posting other videos, consents to develop debates particularly useful to deepen and further explore the topic at stake.

The main characteristics of UGC videos are the *shortness* and the *fragmentation*, as well as a mainly amateur aesthetic. Although technology has made great strides, giving the possibility to the users to provide themselves with high definition cameras and editing programmes quite easy to use, it has to be taken for guaranteed that this has enough to assure a good level of video contents. The opportunity for everybody to generate contents, implies a significant problem concerning the eventual lack of specific competences and experience. In this case, the ability to catch the attention, which is the main aim for many users who upload videos on the web, is linked to the spectacularisation and extraordinariness of the videos posted. As it can be inferred these are elements that contrast the principles I have highlighted in relation to the realisation of a good scientific audio-visual popularisation. The more the rhythm is tight, the less the possibilities of in-depth readings and accounts; the more space is given to the spectacular, much more weaker will be the extent of scientific value. Moreover, the miniaturisation of the videos on personal computers or mobile devices does not allow a proper fruition and lays into the line the attention of the user, which is an essential element when you deal with scientific topics.

Within a scenery that is constantly changing and hybridising, it can be firmly said that in the near future no screen will prevail on others ones, not the one of television, or the one of pc or mobile devices.[277] The TV will respond to a unique commandment: hybridisation. By time the device will become increasingly complementary; since any platform will be able to indifferently host both videos realised by professionals and the User Generated ones, what every user will have at disposal will appear as magma of contents on different levels. Within this rich, variegated but undifferentiated offer, scientific popularisation will have once again to fight against superficiality and ungrounded information. Once again the task of communicators and specialists will be to try to realise formats able to balance at best the technologies and the languages available with the scientific value of the topics proposed.

> «With the multiplication of the offer, the entertaining content once aimed at gaining the largest number of spectators as possible, is now progressively weakened, while programmes and thematic channels gain value. Today, this day, as the technologies render the fragmentation not only possible but even natural, it has come the time to study a change of paradigm aimed at understanding this new reality instead that keeping to suffer it with heavy consequences. […] By the next years we will experience a flourish of new formats and contents that will radically change the way we conceive television. »[278]

If the user, with these new devices, will not choose if watching satellite, web or terrestrial digital TV, everything revolves around what to see. The strategic choices of the operators will go towards this direction, offering more and more on-demand services and contents on dedicated channels. For that reason we need to hope that among all the offers, besides the entertaining, sportive, artistic videos, the branch of scientific popularisation may find its own space and the opportunity to use all the new digital instruments available for a valid and efficacious divulging.

[277] Tomassini, 2011.

[278] Tessarolo, p. 137-138.

3.4.5 The Telematic Universities and the Video-DVDs

I have left as final case of study and comparison two divulging models that lay at the margin of the traditional communicative channels: the telematic universities and the video-DVDs distributed with specialised magazines and newspapers.
Closer to teaching and didactic rather than scientific popularisation, the telematic universities have been created in the first years of two thousand and quickly spread all over the territory. This typology of institute makes use of the e-learning model, giving the students the possibility to attend courses and classes directly from their own computers, downloading the videos added into the appropriate reference site.[279]
Beyond the considerations on the efficacy and validity of these universities, it is interesting to analyse the videos uploaded on their sites, their shape and structure.

The audio-visual production of telematic universities can be divided into two categories:

1. Theoretical lessons
2. Multimedia production

With regard to the theoretical lessons, a professor, in front of two-three cameras, develops his dissertation. The teacher can use superimposed slides, and most of the times he uses an overhead projector where to display concepts, draw graphics, and deepen the topics. As already highlighted in relation to Nettuno TV, in the case of on-line lessons too, the audio-visual function is reduced to the mere act of recording. In fact the potentialities that could be achieved by elements such as graphic, animation and editing are not exploited. Moreover, almost all the videos analysed, clearly lack rhythm: the mere conjunctions of the three cameras and the cuts on the slides are not sufficient to give dynamism to the divulging task; there is no interaction with the students and the aseptic environment does not favour the attention. For these reasons most of the times the argument of the professor is hard to follow. The teaching times cannot coincide with the rhythm of television

[279] Initially, the wideband being not available, the audio-lessons and/or the video-DVDs were distributed to the students.

narration. If to this lack is added the scarce dynamism I have previously referred to and the low quality of transmission (the video is indeed compressed), the general quality of divulging videos on telematic sites result to be clearly rather law.

Some telematics universities have also a section dealing with the multimedia production, integrating the videos of the lessons with scientific audiovisual contributes. Guglielmo Marconi University of Rome, (where I have worked as director and editor), has developed a research and production area called *Marconi Channel*, a television channel devoted to cultural deepening and available online to follow the programmes in streaming and live too.
As support to didactic activities, services and formative contents that the university makes available to their students, the TV-learning supplied by Marconi Channel generally aims to offer in-depth explorations, critical readings and informative spaces on disciplinary areas linked to the different faculties. On the relative web site, the Web-TV offers an interactive thematic menu including: culture and art, science and technology, economics and law, society and institutions and live broadcasts. For each channel there is a series of clip-videos that explore and analyse the specific themes.[280]

[280] www.marconistudios.it.

Telematic Universities in Italy

University	Faculty
E – Campus Via Isimbardi 10 - 22060 Novedrate (CO)	- Economics - Law - Engineering - Arts - Master - Psychology
Giustino Fortunato Viale R. Delcogliano, 12 - 82100 BENEVENTO (BN)	- L.T. Operatore Giuridico d'Impresa - L.M. Law
Guglielmo Marconi Via Plinio, 44 - 00193 ROMA (RM)	- Economics - Law - Arts - Educational Sciences - Science and Technology
Italian University Line Via M. Buonarroti, 10 - 5122 FIRENZE (FI)	- Methods and techniques of educational interactions
Leonardo Da Vinci Piazza San Rocco - 66010 TORREVECCHIA TEATINA (CH)	- Management - Educational Sciences - Psychology - Law
Pegaso Via Vittoria Colonna, 14 - 80121 NAPOLI (NA)	- Law - Human sciences
Tel.M.A. Via di Santa Caterina da Siena, 57 - 00186 ROMA	- Economics - Law
UTIU – Università Telematica Internazionale Uninettuno Corso Vittorio Emanuele II, 39 - 00186 ROM	- Economics - Law - Engineering - Arts - Psychology - Media studies
Università San Raffaele Via Val Cannuta, 247 - 00166 ROMA	-Architecture -Agriculture - Motor sciences
Unicusano Via Casalmonferrato 2/b, zona San Giovanni - piazza Re di Roma	- Economics - Laws - Educational sciences - Politics
Universitas Mercatorum Via Appia Pignatelli, 62 - 00178 ROMA (RM)	- Economics

Video DVD's

Another channel that together with the telematic universities emerges for its peculiar form of audio-visual popularisation is the video-DVD distributed as supplement of specialised magazines and newspapers. This phenomenon, especially in recent times, has seen a massive growth and has allowed the publication of several scientific series in different fields of knowledge: history, philosophy, art, literature, etc. Among this kind of divulging videos can be found documentaries, conferences, lessons; all this material is usually produced on purpose for these specific products.

With interactive menus, which divide the topic into thematic sections, these supports favour the interactivity and a personalised fruition. Every spectator can choose his personal learning process and is free to explore certain topics rather than others.

The distribution of video-DVDs, easily usable at home, represents another way to incline the large public towards the scientific knowledge.[281]

[281] In the next chapter I will propose the analysis of one of these video-DVDs.

The scientific popularisation is the fundamental bridge between research and culture. Without divulging the research would be asphyxiating. It would be carried out and then it would die.[282]

4

Analyses of Popularising Audio-Visual

4.1 Introduction

Films, documentaries, TV programmes, Web videos and digital videos, represent the five typologies of audio-visual at disposal of scientific popularisers to convey science. Each of them has its own peculiarities and implies advantages and limits, which need to be taken into account in order to realise a programme based on truthful and effective knowledge.

Throughout this chapter, after a short introduction to the specific type of video and its collocation within the respective genre, I will deal with the general structure of each audio-visual and, through a deconstructive *decoupage*[283], I will propose the analysis of some sequences to show the specific film technique that has been used.

---

[282] Pier Giorgio Odifreddi (Cuneo, 1950), italian mathematician and logician.

[283] Among the techniques detected by cinematographic analysis, decoupage focuses on the mise-en-scene. This method consists in analysing each single frame, literally disassembling the film in order to go back to the choices taken originally by the director, to the purpose of understanding his language, his way to transform the screenplay into a story by images. The elements to be valued are: the frame composition, the events of each frame, the movements of the camera, the effects or the cuts of one frame and another, the editing.

4. Analyses of Popularising Audio-Visual

In the last part, I will trace some reflections on the type of direction and the degree of popularisation that has been reached.
Each analysis will clearly show how the video adapts itself to the rhythms and possibilities this tool offers, assuming from time to time congenial functions and characteristics.
In the last part of the chapter I will compare the five typologies analysed, to underline the degrees of scientific value, the ways spectacularisation is conceived and the role played by the populariser.

4.2 The Film: *Mon Oncle d'Amerique*

Mon oncle d'Amerique[284] is a film by Alain Resnais, 1980. It is a fiction-film presenting all the elements and the typical codes of this genre: mise-en scene, peculiar characters and acting style. Due to its peculiar structure and context, it can be assimilated to the audiovisuals engaged in divulging science. Resnais' film uses the life-history of three characters to explain the evolutionary and behavioural theories elaborated by Henri Laborit[285] (who takes also part to the screen writing). The aim, as declared by Laborit himself, is to let the scientific theories emerge from the personality of the characters. These do not directly tell the occurrence of a scientific event, it is rather science that provides the keys to decipher human behaviours.[286] The words used by Laborit confirm the thesis of a mise-en-scene in favour of science: *"my ideas are not displayed to explain the behaviours of the characters, but serve to decrypt them"*.[287]

We can therefore refer to a screenplay that is built through the integration of two levels: the fiction-film narration and the scientific digressions intended to explain the comportment of the three characters. During the sections devoted to

[284] Original title: Mon Oncle D'amerique. Direction: Alain Resnais. Interpreters: Pierre Arditi (Zambeaux), Nelly Borgeaud (Arlette Le Gall), Gerard Darrieu (Veerstrate), Gerard Depardieu (Rene' Ragueneau), Marie Dubois (Therese Ragueneau), Nicole Garcia (Janine Garnier), Henry Laborit (Henry Laborit), Philippe Laudenbach (Michel Aubert), Roger Pierre (Jean Le Gall). Subject: treatise by Henry Laborit. Screenplay: Jean Grualt. Photography: Sacha Vierny. Music**:** Arie' Dzierlatka. Editing: Albert Jurgenson. Nationality: France. Year: 1980. Length: 125 min. Production**:** Philippe Dussart in Coo-production with Andrea Film E T F 1.

[285]Henri Laborit (Hanoi, 1914 – Paris, 1995) was a French biologist, philosopher and ethologist. To Laborit is owed the introduction of chlorpromazine that in 1952 was the first neuroleptic medicine for the treatment of schizophrenia. Earlier, in 1951, he devoted to the study of hibernation. During the Sixties his studies defined the effective importance of the cells of glial cells and of the role played by free radicals in the organism. With his book *La nouvelle grille* (1974) his ideas on behavioural biology became known to the large public and found a good acceptance within the favourable context after '68. During his career Laborit won in 1957 the Albert Lasker price for medical research, in 1972 the medal of the World Health Organisation, in 1981 the Anokhin price and he was nominated for the Nobel price.

[286] M. Merzagora, 2006. p. 221.

[287] M. Merzagora, 2006, p. 221.

popularisation, Laborit himself clarifies the concepts supported by overlay images, which are didactic and symbolic. At this level the fiction film gives space to scientific explanations; here the actions of the characters are used as complement to the theories.

In the first of the two following analyses, I have detected the general structure of the film by dividing it into narrative sections in order to highlight when and how the scientific digressions are integrated into the film flow. In the second analysis I made a decoupage of one scientific sequence, in order to understand which codes, styles and elements of audio-visual grammar have been used.

4.2.1 Analysis of the Film

First of all I have analysed the general structure of the film (Appendix A – A.2.1). The sequences correspond to the sixteen chapters into which the film is divided and that are listed in the interactive menu too.
As it can be observed from this subdivision into sequences, director and screenwriters have chosen to interweave Laborit theories with the vicissitudes of the three characters throughout the film narration. The most part of the sequences (A/V language: fiction + popularisation) consists of a fiction and acted section, and of another section where the voice-over (of the same Laborit) gets the upper hand and explicates the theory in relation to the facts that just happened. In this second narrative modality, the images are symbolic and didactic; they serve to support the explanation of Laborit by providing visual references.
The general structure is then formed by a continuous chasing, from the beginning to the end, of an explanatory-demonstrative mechanism that helps the viewer to understand the dynamics regulating the relations among the three characters.

4.2.2 Analysis of the 11th sequence: the Rats in the Cage

I have broken down the sequence number 11 in order to let emerge the main components of the audio-visual grammar (frames, graphic, sounds and music).
This examination (Appendix A – A.2.2) highlights the stylistic-divulging interweave that can be found in nearly all the sequences of the film. The fiction scenes that see Le Gall, Janine and Ragueneau as protagonists, are alternated to explanations where Laborit states his theories in first person or by a voice-over.

Frame 1 - Rat in the cage

Frame 2 – Laborit enters the scene

4.2.3 The Direction

From a directorial perspective, the fiction scenes are dominated by moving frames (tracking shots, hand camera following the protagonists, pans shot) of middle length (from 10 to 30 seconds). During the dialogues has been used the shot/reverse shot technique. This is a classical style direction, without stylistic peaks or personal digressions. The editing is invisible.[288]
The divulging scenes, since integrated and interwoven within the narrative texture, are not detached from the rest of the film. Sometimes they consist of long

[288] Invisible editing. This narrative technique mainly consists in connecting the different shots in such a way that the viewer does not become aware of it, facilitating a deeper and "softer" involvement into the film itself. Indeed, if you watch a film without caring for the editing and the choices made by the author, you are easily led to identify yourself with the events and their protagonists. The aim of the classical découpage is therefore mainly dramatic.

frames[289] to combine the narrating voice, other times they consist of few frames (lasting minimum 2 seconds) used as flashes of the notions explained by Laborit. These are emblematic visual examples, most of the times grouped together into three-four frames blocks.[290] The editing results then more expressive, since it is meant to stress the visual details or the meaningful combination of the shots.
In these scenes the audio plays a significant role too. To the narrating voice are added the voices of the characters and the siren of the laboratory that recalls the experiments on rats, reminding of the CR of the human guinea-pig.
For the construction of the divulging part, Resnais has chosen to dig out scenes from the past of the protagonists, sometimes already displayed, and to mix them with the shots of the laboratory animals.

4.2.4 Degree of Pupolarisation

According to the elements we have so far analysed, *Mon Oncle d'Amerique* can be seen as an experimental film. Its construction is conceived so that the narrative flow in the fiction section slackens its rhythms and totally stops it in the divulging scenes during the explanations that return to the events just reported. As a river merging into the sea, the scenes where Laborit makes his entrance can be considered bends of analysis and inquiry on the behaviours of the three characters. However all that is mixed in such a way that enables the narration to flow smoothly, with no sharp or violent breaks, with no hitches. The final result is an interesting film, involving for its construction and intriguing thanks to the theories corresponding to the behaviours of the protagonists. The scientific popularisation is particularly effective, thanks to the visual symbolisation by which Resnais explicitly conveys the concepts elaborated by Laborit.

[289] E.g. Tracking shot on the corridor of the laboratory, sequence n. 3.

[290] E.g. Sequences n. 5, 7, 9.

4.3 The Documentary: *From the Depth of the Soul*

From the Depth of the Soul[291] is a documentary that retraces the life and the thought of Carl Gustav Jung. This film is not the classical work of chronological reconstruction of biographical events, but it rather intends to provide an exhaustive overview on the complex life and thought of the Swiss psychiatric. *From the Depth of the Soul* belongs to the category of biographical documentaries; Jung's life is reconstructed through a voice-over, interviews and images of the places of his life.

I propose below two analyses of this work. A structural one, which detects and subdivides the film into nine thematic sections, and one meant to track down the key elements from the perspective of the audio-visual grammar, dissecting the first two chapters to highlight how text, shots and music are calibrated.

The common thread unifying both the analyses is represented by two narrative levels, a descriptive one and an oneiric one, which are mutually integrated to give a complete and wide view of Jung *Weltanschauung*.

4.3.1 Analysis of Documentary

The film is structured into nine sequences that constitute the nine themes of the film narration (Appendix A – A.3.1). Within these nine sequences the director has chosen to alternate three typologies of audiovisual code depending on the contents: the voice-over in third person (the film-maker's voice), the interviews to the daughters and nephews of Jung and the voice-over in first person (as if it was Jung him self speaking).

According to the use of these three perspectives, the documentary-film alternates two narrative levels.

[291] From the Depth of the Soul. A tribute to C.G. Jung, Direction, research and text: Werner Weick; Filming and Editing: Luciano Paltenghi; Sound: Luca Maccanetti; Sound mixer: Norberto Poretti, Paintings: Chagall, Jawlensky, Gabai, Janssen, Dobrozansky; SSR/RTSI-PALFILM coo-production; Length 53; Year 1991.

1. **Level A: The classical descriptive narration**
   At this level images, acted text and music follow a typically didactic development. The voice-over, almost always in third person, holds a very significant function, audio and video serve merely as support. At this level there are the sections concerning the descriptions of "real" experiences lived by Jung and photographs and images from his life and the places he lived in. At this level we also find the interviews, which do not rely on questions but directly enter the account of the narrating voice to enrich and complete the description of the protagonist's life.

Frame 3 – Jung

Frame 4 – Jung's house at Bollinger

2. **Level B: The "Oneiric" narration**
   At this level the acted text is more deeply mixed with powerfully symbolic images and "immersive" sounds that contribute to create a mysterious dimension. The voice-over speaks always in first person and corresponds to Jung's thoughts, reflections and accounts.

Frame 5 – Mandala

Frame 6 - Onirism

4.3.2 Analysis of the First Two Sequences

Subsequently I have broken down the first two sequences of the documentary through the *découpage* technique, in order to identify the elements of audio-visual grammar (frames, graphic, sounds and music). On the Appendix A – A.3.2, in the column referring to time, in brackets, I have indicated the level the section analysed belongs to.

As it can be noticed by the continuous alternation between these two levels, the film-maker is able to maintain a balance without exceeding into a slavish narration of the events of Jung's life, or into visionary temptations potentially misleading for the viewer. This exactly represents the originality of the film, the amalgam of ingredients (A and B level) properly dosed to create an atmosphere that complete the complex portrait of Carl Gustav Jung.

4.3.3 The Direction

From the point of view of direction, the level A sequences have a narrating voice in third person blowing out any musical comment that is too loud, usually leaving only the music theme as background. In these sequences Weick has used archive library pictures, shots of the places where the psychiatric used to hang out at and classical interviews (the interviewee sitting on the right or left side of the screen and looking at the opposite direction). These images appear markedly didactic in respect to the acted text.

In the level B sequences instead, voice-over and images are apparently detached. In this case the director has chosen an experimental way to visualise the concepts expressed by symbols and icons (shots with more movements, photos that most of the time are approaching). All this supported by wrapping and immersive music and sounds. The music theme also, when present, is lightly distorted and contaminated.

4.3.4 Degree of Popularisation

This film documentary by Werner Weick relies therefore on two levels that give place to an original way of describing Jung life and thought. The film-maker has abandoned the mere chronological reconstruction of life events, to the advantage of a detailed and exhaustive description of the complexity of the Swiss psychiatrist and psychologist. In less than one hour the video touches only some of the themes concerning Jung's research and very little, almost no material, has been provided about his scientific or literary production.

Since the beginning of the film, the film-maker wanted to point the attention on the thought and the vital innate boost that led Jung into the research of the self. Perfectly in tune with the Jungian style, Weick has composed a voyage of discovery and analysis where real facts leave often space to visual and auditive atmospheres whose power can penetrate the sensitivity of the viewer. From this point of view the audiovisual language has demonstrated to be an appropriate tool to convey feelings and suggestions necessary to describe a complex and multiform personality as the one of Jung.

4.4 The TV Programme: *Il Corpo Umano, il Cuore*

Il corpo umano: il cuore[292] is a popularising programme produced in 1990 by Rai l. The formula is the transmission in studio, where Piero Angelo is the anchorman. He leads the viewer throughout footages, animations and graphic inserts, used to explain different aspects, at times even complex, concerning the cardiac system.

The real peculiarity characterising *Il corpo umano: il cuore* is the idea to reduce the correspondent to the dimension of a bacterium that weaves into the arteries, the mitral valve and the ventricles, in order to show very closely their functioning. Angela himself, turned into a sort of shrunk alter-ego, navigates the blood vessels straddling a red blood cell and explaining the mechanisms of arteriosclerosis. The effect is at the same time surprising and engrossing. The sceneries, obtained by pictures taken from reality and realised through an electronic microscope, together with the animation of physiological elements that interact with the "correspondent", render the trip of the "normal-sized" presenter realistic enough to achieve the suspension of incredulity by the viewer.

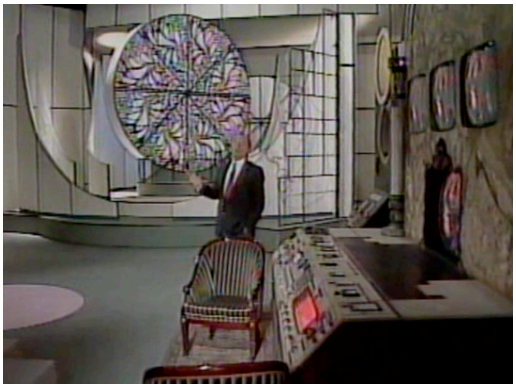
As well as being reason of fascination, the interventions of the correspondent Angela represent fragments of realistic analyses offering a significant contribute to deepen the explanation. The analysis is further favoured by the interaction between the correspondent and the presenter in studio. This dialogue facilitates a more dynamic account and improves the efficacy of popularisation. In the first two following analyses I have highlighted the structure of the programme by dividing it into narrative sections. Subsequently, I have analysed one of these thematic section focusing on the audio-visual language and the type of direction used.

[292] *Il corpo umano: il cuore* is part of the series *La Macchina Meravigliosa*, by Piero Angela. Direction by R. Costantini - 1990. Rai1 and De Agostini Production. Pal, Colour, 60 min. "La Macchina Meravigliosa" consists of several episodes integrated by RAI into the didactic project called "Mosaico".

4.4.1 Analysis of the Programme

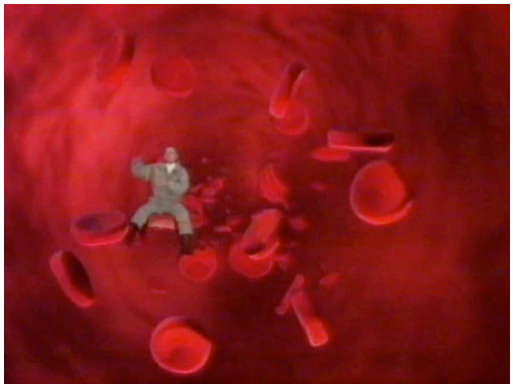
I have detected 15 narrative sections (sequences) that mark the general rhythm of the film (Appendix A – A.4.1). The audio-visual structure is characterised by a regular rhythm that calibrates three elements easily identifiable: hosting in studio, external contributions (voice-over videos or graphic animations overlapping the explanations by Piero Angela), the voyages of the correspondent. According to the setting we can then trace three elements:

- In studio. Few shots, most of them static. While speaking with the correspondent, the presenter is sitting at a workplace full of buttons, joysticks and monitors. Piero Angela interacts with the correspondent, who appears on these screens. Besides this "interactive" position in the studio there is also a spinning platform and some screens by which are launched the external contributions.



Frame 7 – Piero Angela in Studio

- Inside human body. The correspondent is always speaking from different areas of the cardiac system. He passes from the mitral valve to ventricles and arteries, describing and explaining the elements surrounding him. In this case the sceneries wrapping around him are perfectly balanced and can be animated. The artery wherein Angela straddles the red blood cell is particularly impressive. The passages from one frame to another are marked by fades. The correspondent, addressing and interacting with the anchor-man, actually means to address the spectators.



Frame 8 – Piero Angela inside Human Body

- The footages. They are of different types and are used to explore more deeply the thematic at stake. They are all voice-over and realised by animations and graphic or through real archive images.

Frame 9 - Footage

These three elements are balanced so that they compose an audio-visual explanation of the topic by a diversified language.
The strength of the programme does not exclusively rely on graphic and scenic effects, but it is established by the lively rhythm by which the external contributions and the explanations of the correspondent weave the narration. The anchorman can be considered as the "bridge" that by his introductions,

explanations and examples, joins the various external explicative islands into a sort of homogeneous instructive archipelago.

4.4.2 Sequence Analysis

I have analysed one of the sequences including all the three elements mentioned above (hosting in the studio, external contributions, voyages of the correspondent) to let emerge the stylistic and linguistic codes used.
As it can be inferred at first glance by the Appendix A – A.4.2, the programme hosted by Piero Angela is doubtlessly word-centred. The presenter's and correspondent's voice and the voice-over are the engine of this audio-visual. Selected images taken from the three settings clarify and deepen the notions and descriptions. Particular attention is paid to the direction and editing too, which changes according to the presented settings.

4.4.3 Degree of Popularisation

After over twenty years since its realisation, the programme by Piero Angela still represents an unquestioned example of didactic and scientific audio-visual able to find a balance between the accuracy of the divulging task and the ability to fascinate and involve, holding the attention of the spectator until the end. The rhythm is dynamic for the whole duration of the programme and there are no drops in strain. Each narrative section offers large space for deep explanations of the topic with the aid of overlay videos and animations that duly clarify the notions conveyed. As already stressed, the surplus value of this product is given by the presence of the correspondent, who shrunk and immersed into the cardiac system, allows the viewer to look closely at the circulatory functioning through images directly coming from the microscope. The degree of popularisation is then very high, and in spite of the necessary process of simplification required by a TV programme, the explanations are detailed and exhaustive. This is one of the most successful combination of audio-visual and popularisation.

4.5 Web Video: *The Origin of Pleasure*

The Origin of Pleasure is one of the video offered by the portal www.Ted.com. As already mentioned in Chapter 3, this is a global community collecting accounts and scientific demonstrations meant to convey an insightful reading of different aspects of reality. The video that I have taken into account is emblematic with regard to the style and the philosophy of Ted-Videos. The speaker on the stage has primary importance: in front of a very attentive audience he tells his theory during twenty dynamic and energetic minutes where his charisma is the main attraction. The narrative flow unravels adding to the stories told by the professor slides that from the screen on the stage are overlay displayed during the key moments of the speech. Together with a direction typical of television that edits the shots taken by three cameras, the slides showing photographs, animations, texts and videos, assure dynamism and consent a further exploration of the topic exposed by the speaker.

4.5.1 Analysis of the Lecture

From the point of view of narration, the sixteen minutes of talk can be divided into nine conceptual sections, bearing each of them a specific function and being masterfully integrated into the general flow (Appendix A – A.5.1).
The video focuses on the figure of the speaker, who develops a structured analysis on the origin of pleasure, pointing the attention on a series of examples that thanks to their spectacular character hold the attention high in the audience. The psychologist is highly prepared and he is supported by slides that help the fascinating and appealing process.

4.5.2 The Direction

The direction of the video is typically derived from television. The three cameras frame the communicator by smooth movements; moving on a large stage and having behind him a screen displaying slides, he addresses the vast audience. The direction alternates shots on the speaker with the slides in full-screen showing pictures, graphic and videos. This alternation is important to be able to grasp the topic and it visually enriches the understanding. Unfortunately at times the low

resolution characterising the diffusion on the web does not allow to fully enjoy the images displayed. Throughout the video the attention is directed to the speaker and the audio-visual register remains constant. There are no changes in the rhythm, although the structure is clearly built upon a series of small sections consisting of "question-answer" brilliantly linked to each other. For this reason it can be said that the spectacularisation is based on the psychologist's capacity to create and emphasise the expectations of the public, immediately providing it with the expected explanations by few gags. To summaries, it is a process of small "catharsis and unfolding" centres throughout the entire video.
Finally, from a technical point of view, the possibility offered by the Web site to use the subtitles and share opinions with other users can counterbalance the low quality of the streaming.

4.5.3 Degree of Popularisation

Due to the direction features that I have underlined, the degree of popularisation of this video is mainly bound to the development of the explanation that the psychologist undertakes during his lecture. Specific data and in-depth elaborations are left out to the advantage of a narration maintained on an appealing level to hold the attention of the public.
The visual spectacularisation is given by the slides shown overlay but it is the narration it self aimed at making the topic brilliant and interesting. The concatenation of examples has the task to demonstrate the initial thesis and tries to give a response to the question on the origin of pleasure.

Frame 10 – TED Conference

Frame 11 – Slide during the Conference

4.6 Video on Digital Support (DVD): *The Pre-Socratics and the Birth of Philosophy*

The last audio-visual I have taken into account is *I Presocratici e la nascita della filosofia*[293], the first didactic video that is part of the series *Il caffè filosofico. La filosofia raccontata dai filosofi*. It introduces to the explanation of the birth of philosophy by means of a channel that has not been analysed so far but that can represent a further tool at disposal of the communicators of science: the video DVD enclosed with newspaper or specialised magazines.

The ninety minutes of video are divided into 24 chapters, consisting of direct explanations by the philosopher Emanuele Severino[294] and by external integrating contributions.

The peculiarity of this didactic video relies on the attempt, conceived by the director and the editors, to give a dynamic rhythm to the lecture of this philosopher. Segmented into conceptual sections by itself, the talk of Severino is enriched by audio-visual digressions that consent an in-depth thematic elaboration, while they visually propose the use of codes (music, video, photos, graphic, voice-over) that facilitate the memorisation.

Hereafter I propose two analyses. The first one, on the entire video divided into sequences, aims to show the general structure of the film and the partition in topics. The second one, on the composition of two specific sequences, wants to go back to the choices made by the film director and understand his language.

---

[293] First video of the *series Il caffè filosofico – La filosofia raccontata dai filosofi*. Place: Caffè Zilioli – Brescia; Speaker: Emanuele Severino; Contents: Giorgia Serughetti; Shooting: Mauro Ferrero; Editing: Andrea Pierri; Musics: Andrea Gattico; Scientific Committee: Maurizio Ferraris, Piergiorgio Odifreddi; Epilogue: Maurizio Ferraris; Direction: Michele Calvano; Digital-E Production– publishing: l'Espresso; Length: 90 min; Year 2009.

[294] Emanuele Severino was born in Brescia in 1929. Under the guide of Gustavo Bontadini he graduates in Pavia in philosophy with a dissertation on Heiddeger and the metaphysics. In 1951 he obtains the tenure. In 1962 he is full professor of ethical philosophy at Cattolica University in Milan. From 1970 to 1989 he teaches at Ca'Foscari University of Venice as full professor of theoretical philosophy and next he becomes the director of the department of philosophy. He is currently professor at San Raffaele Institute in Milan.

4.6.1 Analysis of the Lecture

The sequences correspond to the 24 chapters that, in the interactive menu too, subdivide the video. As mentioned, the chapters can be based on two typologies of audio-visual language: the frontal lecture by Emanuele Severino or the external contributions expressed by voice-over, photos, overlay shots and graphic (Appendix A – A.6.1).

The development of the exposition carried out by the speaker and integrated with different external aids, follows a linear and chronological flow. The analysis of the protagonists of the rising philosophy and their theories starts out from the first thinkers and the historical and cultural context where they come from, to arrive to Parmenides. Except the conclusion, the sequences last less than seven minutes and are introduced by a title set to music that marks a pause within the conceptual flow. The alternation of frontal lecture and external aids serves to contribute to the dynamism of the entire audio-visual. Moreover, in the initial interactive menu, the 24 sequences are grouped together into 4 sections that further structure the film:

1. Sequences 1 - 9: The birth of philosophy
2. Sequences10 - 18: The first philosophers
3. Sequences 19 - 23: Parmenides and the Being
4. Sequence 24: Conclusion

As already anticipated, the levels of film narration are alternated: frontal lecture and external contribute. Hereafter the analysis of them.

4.6.2 Analysis of the sequences

Subsequently I have analysed two different sequences to demonstrate the language alternance between *Frontal Lecture* (Appendix A – A.6.2) and *External Contribution* (Appendix A – A.6.3).

In the frontal lecture Severino is sitting at a coffee bar table. His oral explanation proceeds plain with no other intervention: no images and music are added to the talk. The single element determining the rhythm of the narration are the scene changes. Two frames are indeed alternated: medium long shot on Severino sitting

at the table and close-up on his face. Only in one case, there is a cut to a detail of his eyes.

This is a classical setting of television direction that prefers the neutrality of the cuts to any other type of visual effect. The change of framing exclusively serves to mark the rhythm of the sentences to help the viewer memorising the notions exposed. This kind of direction can be defined "invisible" since it is totally in service of the statements elaborated by the speaker.

Since the audio-visual has enormous potentialities in the field of scientific popularisation and the capacity of the viewer to hold the attention on someone speaking facing a camera is limited, the sequences with the frontal lecture of Severino are not longer than 7 minutes and are alternated with external contributions.

Frame 12 – Frontal Lecture

Unlike the frontal lecture, the external contribute is rich in images, graphic and sounds. It is led by a voice-over that has the task to explore and deepen the concepts expressed in the frontal lecture section. The images are used as cover and can be:

- Didactic, namely linked to what is said (water – images of water, fire – images of fire, maps of the places, etc.).
- Referred to the philosopher at the core of the lecture (busts and frescos portraying the thinker).
- Abstract, to serve as simple support to the words (clouds, stars, etc.).

The switch over of images always occurs through a crossed fade that softens and makes more homogeneous the juxtaposition of distant videos and graphic elements. Between one scene and the other there is a fade-in/fade-out marking the end of a statement and the beginning of a new one.
Very important are the key concepts appearing in overlay. These words, synchronised with the voice-over statements, allow the spectator to fix in his mind some useful points of reference. Throughout the entire sequence a background piano music leads the words.

Frame 13 – External Contribution

4.6.3 Degree of Popularisation

The construction of *I presocratici e la nascita della filosofia,* develops, to a general level, according to the continuous juxtaposition of two levels that offer a dynamic reconstruction of the issue and facilitate, through the use of the audio-visual codes at disposal, the process of learning and memorising. Thanks to the external aids, the exposition of Severino is not left alone but is integrated into a dynamic context that makes use of all the codes available (graphic, music, effects) in order to be better fallowed by the viewer.
The didactic communication perfectly combines with the audio-visual language, creating a divulging style characterised by an involving rhythm that holds to the fore the transmission of contents.

4.7 Comparison

To realise a scientific audio-visual is necessary to undertake choices and simplifications that if on one hand assure the approachability by the viewers, on the other one can prevent from tackling the topic in depth and exhaustively. In respect of a text or an article, it is clear that who conceives the video is required to select and contract the contents in order to fit times and rhythms of the language by images. For this reason the narrative flow will certainly result less intense but at the same time able to use properly the audio-visual grammar, making use of tools (images, sounds, graphic) giving light to a multi-sensory scientific communication. In this sense it reveals to be very useful as complement and integration to the written word.

In the summarising table below I have traced a comparison of the five videos I have analysed, specifying which elements emerge and make the communication forceful and which are instead the limits the specific channel implies.
By scientific accuracy I mean to take into account the transmission of scientific contents within an audio-visual flow relying also on narration, effects and at times fiction elements too.
To evaluate the ways conceived to spectacularise, I have evaluated the use of images, graphic and effects: the way they are integrated with the scientific message and if they play a key role or if simply represent complementary tools.
Finally, I have considered the role of the scientific populariser, in an attempt to understand if, when he is present, he is determinant for the understanding and transmission of contents or if his function is to merely group together the different film levels.

AV type	Scientific accuracy	Spectacularisation	Communicator
Film *Mon Oncle d'Amerique*	**Medium level** It emerges to explain the interweaves linking the characters and plays a significant structural function. Balanced relation between mise-en scene and scientific explanation.	**High level** Use of elements typical of fiction films. The scientific explanations are supported by images already displayed or by efficient symbolisations (e.g. man with a rat -head). Graphic and effects are absent.	**Medium importance** Laborit appears on the screen in first person. His presence serves to detach the viewer from the fiction cinema and to stress the digression into scientific explanation. The scientist speaks through a voice-over too. His role is then determinant for the comprehension.
Documentary *From the Depth of the Soul*	**Medium level** Although focused on the Jung's biography, the director does not narrow the film to a mere chronological reconstruction of his life events, but he gives a wider and deeper account of the complexity of the Swiss psychiatric and psychologist. Only few themes of his research are touched and almost no reference to his scientific and literary production is given.	**High level** It mainly emerges from the "oneiric" descriptive part where the repeated text (words by Jung) is mixed with the power of symbolic images. The music theme too, when present, is lightly distorted and contaminated. Use of effects.	**Low importance** There is no communicator. The voice-over that alternates with the voice expressing the Jung's thoughts is surely important but it cannot be entirely assimilated to the presence of an expert that explains. It is rather part of the flow of biographical description characterising the film.
TV programme *The Heart*	**High level** In each narrative section there is room for the in-depth explanation of the topic with the support of the overlay videos and animations that punctually clarify the concepts. The degree of popularisation is then high, and in spite of the simplification process that is necessary for a TV programme, the explanations are detailed and well explored.	**High level** Graphic, filmed contributes, a multimedia studio contribute to render the programme engrossing. The surplus value is given by the correspondent, who reduced to minuscule dimension and immersed into the cardiac system, allows the viewer to closely see the circulatory functioning through images directly coming from the microscope. Massive presence of graphic and effects.	**High importance** It is evident that the role of Piero Angela is fundamental, being the programme focused almost exclusively on his explanations. His role is also important since he connects from the studio the external contributions that are proposed.

Web – Video *The Origins of Pleasure*	**Low level** There is no deepening or reference to specific data. The whole talk relies on its power to appeal. A large number of examples hold the attention of the public.	**Medium level** High interaction between professor and slides. They represent the only element that rendering the presentation dynamic. The spectacularisation is entirely based on the ability of the communicator.	**High importance** The role of the communicator is fundamental. Since this is a conference, the result entirely depends on the communicator's ability to convey the concepts and to use at the best the audio-visual supports.
DVD videos *The pre-Socratics and the Birth of Philosophy*	**High level** The didactic communication successfully combines with the audio-visual language, creating a divulging style whose rhythm is involving and able to keep to the fore the transmission of contents.	**Medium level** The parts in the studio are realised by a classical direction alternating two cameras. The extent of spectacularisation is limited and the whole is focused on the words of Severino. During the video inserts to the narrating voice are added photos, videos and music, as well as overlay words. At this level graphic and effects are massively present.	**High importance** The major part of the film focuses on the figure of Emanuele Severino while explaining. The video inserts are meant to deepen his lecture.

This comparison outlines the different audio-visual channels that can be used by adopting, in a balanced way, the tools at disposal. The key for a plain and proper communication of science through films relies indeed on the right balance between scientific degree and spectacularisation. Every time a video is conceived, this balance has to be recalibrated and redefined according to the issue at stake.

The films, in which fiction represents the narrative pivotal point, can be used (as in the case of *Mon Oncle d'Amerique*[295]) in an original and involving way. The spectator is involved into the flow; and the scientific explanations, combined through a thoughtful dosage, represent an interesting and useful key to the reading of the relational and ever changing interweave among the protagonists. As a *deus*

[295] As well as *Mon Oncle d'Amerique*, other fiction films that have also made use of experimental techniques to convey scientific theories although with a major degree of spectacularisation, are: *A beautiful Mind* (Ron Howard, 2001), *Cartesius* (Rossellini, 1974), *Stati di allucinazione progressiva* (Russel, 1980). For a complete and exhaustive review on the scientific imaginary on wide screen it can be useful to refer to *Scienza da vedere* by Matteo Merzagora.

ex machina, Laborit enters the scene and suspends the narration but keeps guaranteeing a deep insight through explanations supported by *ad hoc* photo montages.
As concerns the documentary, I have chosen a specific instance that lays outside the range of models I have proposed in the second chapter. This is motivated by the need to underline how it is possible to convey knowledge by using also images, graphic and music to create particular atmospheres and enabling the viewer to get deeply involved and engrossed into what he is watching.
TV programmes and Video DVDs, since they have been realised with the purpose to communicate scientific concepts, probably represent the most exhaustive models from the point of view of contents. Although they differ for construction process and audio-visual grammar, they both own the capacity to competently and efficiently transmit knowledge and concepts.

To conclude, the final consideration emerging from this comparison, refers to the difficulty of producing a proper and efficient communication through Web-videos. Short length and low definition render the popularisation through the web a synonym for oversimplification and superficiality. For this reason, as already explored in the previous chapter, the web-videos have to be integrated into a "connective texture" (blogs or specific web sites) where there can be also texts, photos and graphic, in order to provide a more complete multimedia communication. Although we are experiencing a time of profound transformation, where the main characteristic is the intermixing of different languages, I believe it is very important to underline that in order to offer a proper scientific communication, new technologies and platforms have to be used in a thoughtful and balanced way. Otherwise the risk is to totally weaken and lose the scientific value to the advantage of an empty spectacularisation.

The audiovisual language is an autonomus language, not a substitute of something. It is a language by images in movement that offers the viewers various possibilities: information, communication, comparison, analysis, synthesis. Therefore it owns peculiar characteristics both expressive and communicative. [296]

5

Technique and Case of Study

5.1 Introduction

The value of the audio-visual in the transfer of information essentially relies on the power of images and sounds. When the language by images is properly used, information is transferred to the viewers through visual and audio channels. It is then necessary to establish a different and balanced approach, where there may be a greater sensory involvement and where the participative aspect may play a determinant role for the transmission of knowledge. In order to do that the audio-visual has to present a series of ingredients wisely calibrated. The transmission of knowledge in order to guarantee scientific accuracy has to find a balance by using a language where shooting, editing, sound-track, graphic and effects do not serve to make an empty event spectacular, but to assure that integration by which the viewer can enjoy a portrait definitely richer and more complete about the issue explored.

The realisation of a popularising video offers different opportunities depending on the channel, the selected tool and the scientific area we are working on. In this sense, making the theme appealing, and if possible spectacular too (obviously

[296] Virgilio Tosi (Milan, 1925), scientific populariser.

within the limits of legitimacy and ethics) it is highly recommended and not something to be considered with perplexity or even worst, with disdain. If the common feature of any attempt to make science is to confront with the facts of reality, to emotionally involve is the base of all kind of communication.[297]

During the ideation and creation of a popularising audio-visual, the need to get the spectator involved often requires questioning the canonical forms of the scientific work. An audio-visual elaboration, especially if scientific, does not need to follow the chronological succession and the events to the letter. The chronological structure of a written text can be changed and reshaped through the wide range of codes and instruments that the audio-visual form offers. Graphics, flash-backs and flash-forwards, slow-motion, accelerations, are only some of the several tools in which the author can indulge to create a scientific audio-visual as much as efficacious as possible. In this sense, the possibility to trace back the themes to a narration flow, may facilitate the realisations of an audio-visual relying on a "classical" screenplay.

Starting from the script, often taken from scientific books or texts that need to be adapted so that they can be translated into audio-visual language, it is possible to undertake the production phase, offering the possibility to work with different elements and tools. From the original shootings to the use of archive material, from the presenter in studio to external reports, during the production it is possible to drawn on and combine at one's liking various elements to calibrate at best efficacy and spectacularisation.

Once that the collection of data has been completed, the populariser has to assemble and combine all that in the editing phase. In this case too it is very important to choose proper techniques, appropriate graphics and useful effects. The editing is indeed the final part of the work and it is determinant to create the message you want to convey.

[297] Carrada, 2005, p. 58.

In this chapter I have analysed the phases that led me to the realisation of a popularising audio-visual starting from a scientific book: *Neuropsicologia dell'esperienza religiosa.*[298] It explores the neuron-psychological base of mysticism and gives an account for updated data of recent scientific studies.

[298] Fabbro, 2010.

5.2 The Pre-Production

5.2.1 Screenplay

Before to write the screenplay of a scientific audio-visual it is necessary to take into account the selected communicative tool. This choice depends on the kind of communication you mean to create and on the public you aim to reach. As we have seen in the previous chapter, due a series of linguistic and structural features, the script changes according to the specific genre (fiction film, documentary, television programme or Web-video) and type of production and diffusion. The text the director disposes is determinant for the following production phase, since it narrows the range of stylistic elements and tools to be used.

In some cases, the realisation of an audio-visual involves the formulation of an original narration containing scientific concepts (e.g. *Mon Oncle d'Amerique*). To give life to an autonomous film story is not an easy task at all but it can capture the public. To transpose the themes into a story can help the experts to realise an audio-visual relying on a "classical" screenplay. Moreover, that operation, if wisely carried out, consents a remarkable impact and an *emotional hook* with the public.

Emotionality has to be taken into consideration when you realise a script for a scientific audio-visual. In his book *Raccontare la scienza*,[299] Piero Angela claims that the populariser who uses films has to offer *high* contents by holding the attention of the public through emotionality. One of the noblest expressions of emotionality is curiosity, namely the pleasure to explore, which is bound to the desire to be comforted, to not be in the dark, ignoring what is happening around. Therefore, in order to get the message across the public it is not enough to be clear. It is an inescapable condition, but not sufficient; it is also necessary to result interesting and engrossing. The spectator needs to be assured the pleasure of learning.[300]

[299] Angela, 1998.

[300] Angela, 1998, p. 30.

Other times, the script originates from the transposition of a scientific text of reference. This passage, called adaptation, implies a semiotic transmutation (from one language to another one, from text to film, see Chap. 1); new and different information contribute to enrich the viewer's experience.
With regard to my work, I started from a scientific text recently published: *Neuropsicologia dell'esperienza religiosa* by Franco Fabbro and I have realised a transposition for a format that envisaged the dissection of the text into video-clips from 5 to 15 minutes long. Together with the author, I have decided to realise short clips for their high adaptability. Short fragments are indeed easily graspable and at the same time allow, once that are unified into a single flow, to create a documentary.

5.2.2 Ideation and Organisation

The first step during the conception stage of a scientific video is to establish the visual potentialities of the topic that will be treated. Some scientific subjects such as mathematics, physics or chemistry require an high degree of elaboration and visual symbolisation; to correctly convey their contents through the video is necessary a certain ingenuity and ability in visualising. For these subjects can be devised original models of explanation through animation or efficacious graphics with a professor-presenter who uses them in a dynamical way. It is evident that if the concepts to communicate are concepts such as formulas or algorithms, they cannot be altered, although it is possible to create a visual corollary to facilitate their transmission.

For those disciplines that can visually represent the phenomena this process is rather different. The type of narration and story, among the several that can be built starting for the same topic, has to be coherent with the set aims and with the scientific message. A good story of science, as well as conveying knowledge and rising emotion, should enable to fly high, offering an important key to interpret the topic or to communicate its meaning. In other terms the story needs to reduce the

complexity of the subject to a "legitimate" level, trying to sacrifice the less as possible the conceptual depth.[301]

For *Neuropsicologia dell'esperienza religiosa* I have chosen a format that somehow recalls the video-DVD *I presocratici e la nascita della filosofia* analysed in the previous chapter. Among the different models available, this one has been the most suitable for transposing the scientific text, since it has allowed a simple and clear transmission of contents. In the video-clips that I have realised, the book's author, Franco Fabbro, talks sitting in front of the camera, immersed in a warm light atmosphere and with a bookcase on the background. In this environment, ideal for the direct transmission of concepts that are often complex and deep, the recording has been simple and rapid, without using expansive equipment.
During the ideation and organisation stage I have also started to consider the eventuality to enrich the narration by Franco Fabbro through a series of elements (words, photos, video and music) to be inserted overlay during the editing phase.

5.2.3 The Adaptation

In order to have at disposal a good subject built on a set of clear and univocal elements, a useful and rather employed operation in the popularisation is to make use of scientific essays and books that can be partially or entirely adapted. The adaptation, that is the semantic transit from a linguistic system to another one, implies the reformulation of concepts in order to obtain an original and proper script to realise the screenplay.

The first step consists in the transposition of a scientific text into a treatment from which will be next created the screenplay. This translation is not aimed at reproducing a mere formal correspondence and a literal accuracy, but it wants to renew the reference text, giving life to a new text that may guarantee an authentic

[301] Carrada, 2005, p. 92.

adherence to the original one and that at the same time may transform the way to perceive. The adaptation is a translation modality that embraces the possibility to create a new work, potentially different form the original. If in the translation the critical attitude remains implicit, in the adaptation it becomes preponderant and represents the same gist of the transmutation process.[302]

It is therefore necessary to understand to what extent and how works that mechanism allowing the passage from a system of linguistic signs such as the written text to a system of non-linguistic signs as the audio-visual. Many authors and critics consider the adaptation in terms of a creative act that maintains the characteristics and the original text but reinvents modalities and style of communication.
For any film-maker or director it is fundamental to work on a text where the exclusively theoretical and literal parts have been erased in favour of a purely 'visual' writing that enables to mentally recognise the possibility of exposition by images.

At the same time, the screenwriter or the film-maker can decide to proceed in a different way, by adding in the new text scenes or visualisations that do not appear in the initial text. Especially from a technical point of view this is a very useful operation since it allows enriching with images concepts that are often cold and scarcely appealing for the public. It is a process of spectacularisation that helps to make the video more enjoyable and expresses the contents from a perspective that the only text would have not been able to do, enriching this way the information provided. The fact that usually, in the common language, the adaptation is defined as a "reduction" for the screen, underlines how the general perception normally looks at the final audio-visual in terms of a narrowing of contents compared the text or book. However, the video always adds something to the original text.[303]

[302] Donghi, 2006, p. 56.
[303] Manzoli, 2003, p. 82.

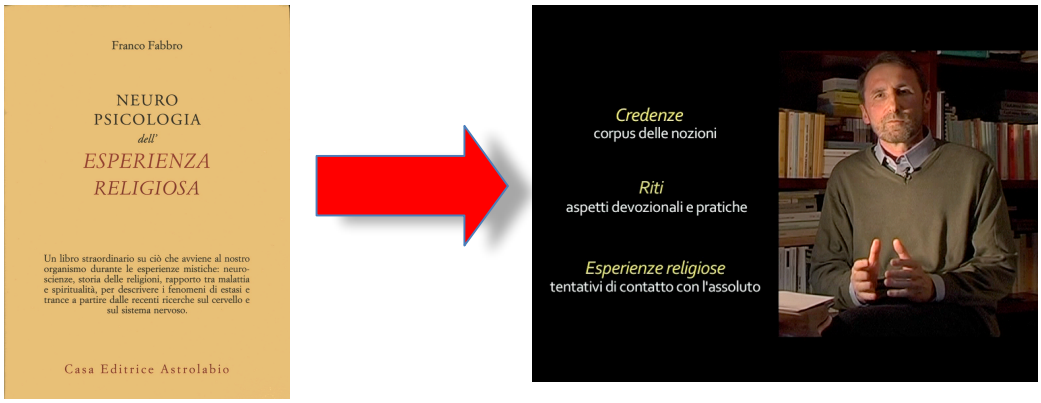
5. Technique and Case of Study

In this process of removal and integration, what counts is to maintain the adherence and the accuracy to the key concepts of the initial text in order to not misrepresent the scientific communication.

> «If I start from a text dealing with a complex subject and I try to make an original translation of it, an *ad hoc* narration; if I do not remove the meaningful parts, at least not all of them; if I am honest and I act in respect of the subject that I am translating, in this way I will produce a different and new story – new and different compared with the one published on Science – but a story that is true to the original spirit.»

In my case, I have chosen the formula of narration in front of the camera, to which later I have added the external visual contributions. I have deemed appropriate that the same author of the book would reduce and simplify the topics exposed. Being the one who best knows the contents of his work, the author has been able to realise an exemplar adaptation simplifying even complex themes. The 450 pages of *Neuropsicologia dell'esperienza religiosa* have been turned into a video about two hours and half long.

For each chapter we have prepared some short texts summarising the contents point by point. Starting form these texts, Fabbro has adapted the topics realising for each chapter narrations that go from 5 to 15 minutes. In each clip, examples and digressions have consented to explore the themes, giving a new and multisensory perspective to the contents.



Frame 14 – Transmutation : Book into the Clip-Video

5.3 The Production

The production stage implies the shooting on the field and the collection of the material that has to be elaborated during the editing in order to enrich and complete the video.
The shooting varies depending on the selected format, the tools and times available (e.g. if you have to film a "unique" event, you have to make sure that the shooting is previously properly conceived). To calibrate at best the shooting you also need to take into consideration the following editing phase and always bearing in mind the final typology of video you want to create.

To realise the clip-videos of *Neuropsicologia dell'esperienza religiosa* I have followed audio-visual technical and grammatical rules that allowed me to achieve the best integration between a correct transmission of contents and a good level of spectacularisation. Thanks to the possibilities given by the new technologies of realising videos with no heavy investments, I have provided myself with a professional camera[304] and a good audio recording system.[305] With regard to photography, I have chosen a simple but characterising illumination.
Disposing of the technical instrumentation, I have undertaken the preparation and realisation phase of the shooting.
This stage can be articulated in the following steps:

1. The first step has been the **set arrangement**. I have chosen to set the shooting in a minimalising context with a relaxed atmosphere: the book's author could therefore address the spectators looking directly at the camera, with no technological filters or digital effects.[306] Framed into a medium long shot, having behind his back a bookcase that gives depth of field, Fabbro has explained the concepts sitting at a table upon which were laid out some books. The idea to

[304] In this case 3 Panasonic CDD of DVX 100.

[305] I have used the Shenaiser clip microphones.

[306] I have excluded for example the use of Chroma-Key. The Chroma-Key is a process based on image elaboration. It consents to create a transparency in specific areas of the image, the ones containing a certain range of colours.

surround the populariser with books was meant to get the spectator into an atmosphere recalling a scientific dimension.

2. The second element that I have considered is the **illumination**. The light permits to stress specific components of the scene and to characterise the events displayed in front of the camera. It was my intention to avoid shadows on the background bookcase and to create a certain contrast on the face of the communicator. All that to give the emphasis on the talking person and to provide a view of the context without peaks.

3. The third element is the **audio**. During the shooting the set guaranteed us a nearly absolute silence. I have looked for the absence of sound for two reasons:
a. It was important that the communicator could focus at best on the exposition.
b. It has been fundamental to record his voice in a "clean way", since it would have been easier later to add music or sound effects (during the montage). It is essential in the communication of science that the communicator's voice emerges over any other sound.

4. For the duration of the **shooting** I have maintained my **camera fixed**, leaving some free space on the left of the author to be able, during the editing, to add the graphics. All the clips have been shot in the same way; the only changes have concerned the dress of the speaker, in order to give the idea of a temporal variation. I have decided to maintain the set unvaried to assure the clips a certain uniformity, which can eventually be summarised by a single video too. The image composition has revealed to be functional also for the post-production phase.

5. The final part of the production has been the **collection of material**. After having watched the shots, I have written an outline of the clip-videos, indicating for each of them which extra contents would have been needed. In this way I have started to collect videos, photos and music to guarantee the covering of some passages of the exposition or the integration of others. Sometimes this research occurred also during the editing phase: once the video was created, I realised that it was necessary a further visual enrichment for some parts.

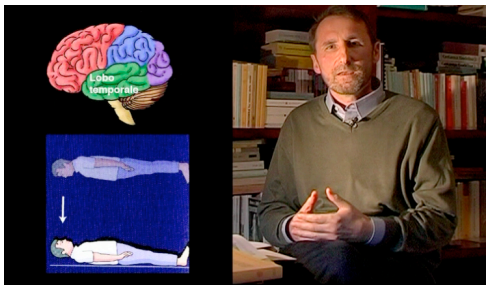
5.4 The Post-Production

The editing is the audio-visual realisation stage 'producer of sense' in terms of direction, development and therefore narration; but also meant as meaning, "concept". [307]

In my case, the editing phase has been the stage where I have experimented the introduction of graphic, photographic and video elements meant to visualise the concepts expressed by the speaker. After having reviewed and catalogued the material, I have started to think about the most efficacious visual solutions for each clip. Keeping the explanations of the author as the backbone of the video, I have progressively added written text, photos and videos. I have finally put the music. The integration of the material has consented to visualise the concepts expressed, providing a further simplification and at the same time a major depth. The possibility to see in real time the results of experiments or peculiar phenomena leads to a process of fascination and "immersion" of the viewers into the matter. Moreover, the aid of texts and graphic facilitates the memorisation of key concepts.

An important technique used during the editing in almost all the clip-videos has been the split-screen. The frame conceived at the ideation stage, with the author sitting on the right side of the frame, allowed me to display written texts and photos on the left side.

Frame 15 – Split Screen 1

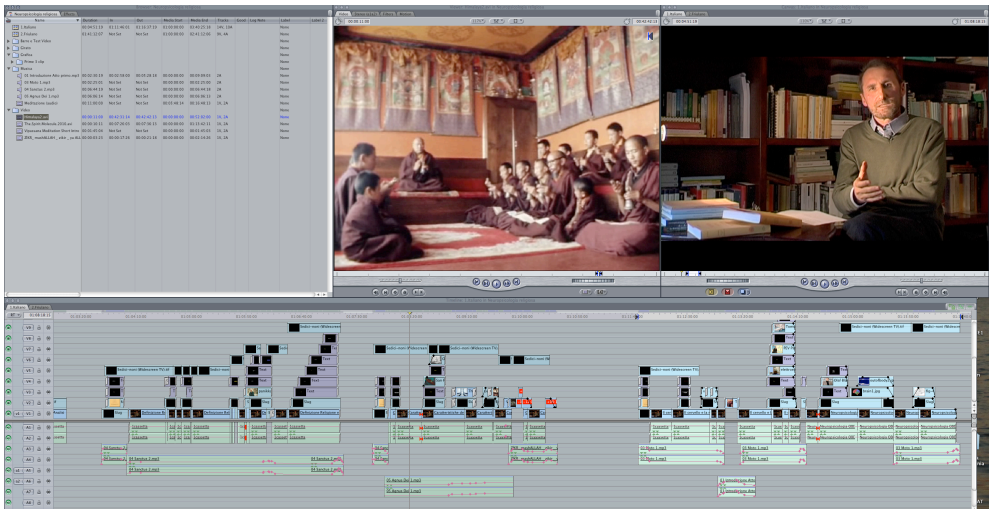


Frame 16 – Split Screen 2

[307] Cassani, 2000, p. 41.

In other moments, where the images were particularly explicative and the populariser could pass in the background, I have decided to put images and videos at full-screen.
The combination of these elements has automatically created a more involving rhythm in the explanation. Moreover, in an attempt to assure the concepts to be fully grasped, I have left some pauses in the explanation where overlay videos or simply music with photos can visually deepen the flow of information provided by the communicator.

Music is the element that I have decided to add at the final editing stage. According to the themes treated, I have chosen different kinds of incidental music. In the clips linked to spirituality and religion I have I tried to use sacred music to enable an "immersion" into the themes.
For the purely physiological parts or where there are anatomical explanations, I have preferred music with a single instrument, sometimes electronic.
In some cases, after having evaluated several possibilities, I have decided to maintain the silence, in order to let the communicator's words be the single sound directly reaching the spectators.



Frame 17 – Editing Time Line

5.5 Characteristics of the Model

Compared with other models analysed in the previous chapter, the clip-videos realised starting from *Neuropsicologia dell'esperienza religiosa*, allowed me to detect the peculiar characteristics for an audio-visual model of scientific popularisation:

1. **The collaboration with the author**. The contribute of the author was fundamental, since he could simplify and adapt himself his text. My technical work and visual elaboration (especially in the editing phase) have integrated his script. I believe that if the aim is to properly convey science, it is necessary that scientists and researchers have to cooperate and interact as much as possible with directors, technicians and editors to create videos at the same time well focused on the subject and professionally divulged.

2. **The visualisation around the guide voice.** The choice to make the book's author to explain the concepts in front of the camera led me to use his explanations as general guideline upon which to sew graphic and effects. In the entire editing I have kept the author's talk as backbone to which I have added sounds, photos, text and videos. The stress on the author voice who from being framed turns, followed by overlay images, into voice-over, assured to create an engrossing rhythm. The choice to transpose a book dealing with different themes and ranging over a variety of scientific disciplines, has given me the possibility to verify which are the fields where it is easier to make use of visualisation and where instead words remain the only proper means of transmission. In the clip-videos dealing with spirituality and mysticism, the integration of images and sounds has represented a successful procedure for a complete and full understanding of the concepts. On the other hand, in the videos centred on human and animal physiology or in the passages linked to the neuron-chemical mechanisms of emotions, the visualisation serves only to visually support words.

3. **The communicative channel**. After having examined the different possibilities available, also considering the analyses carried out during the first part of this work, the adaptability of short clip-videos has consented me to consider different

communication channels. Since characterised by a light structure, the clip-videos can be uploaded on a specific web site, unified together into a single documentary film in chapters and transmitted on TV as scientific programmes “in pills”. They can also assume the form of book’s supplement to offer the reader the possibility to deep its contents. The adaptability of the videos doubtlessly represents the strength of this audio-visual model.

4. **Recipients**. Due to their characteristics, as well as representing an integration to the book, the clip-videos consent a significant simplification of contents. Franco Fabbro, author of the adaptation of his essay, has been able to vehicle even complex concepts with a never trivial simplicity. As aid to his words, the images are a further element that consents to clarify the explanation. For these reasons the clip-videos address a large and heterogeneous public. From the researcher who wants to quickly understand the perspective of the author to the reader who wants to have a clear and synthetic view of the topics contained in the book.

6

Conclusions

6.1 Conclusions

In the course of this work the analysis of the audio-visual forms available to communicate science led me to propose a specific model of video scientific popularisation. After having evaluated limits and potentialities of each communication tool (film, documentary, TV programme, Web video), I have realised a series of clip-videos adapting a scientific book: *Neuropsicologia dell'esperienza religiosa* by Franco Fabbro. The critical-theoretical analyses carried out in the first chapters allowed me, during the production stage, to establish which could be the best visual and structural solutions to reformulate the scientific concepts explained within an essay consisting of over 400 pages. Thanks to the determinant contribution of the author I have realised an adaptation (transposition into screenplay) and afterwards a series of videos 10-15 minutes long. They became a useful tool to clarify, simplify and further explore the topics from a multisensory perspective too. This operation enabled to detect the essential features necessary for a correct communication of science through the video.

A scientific audio-visual cannot substitute a book, but it can represent a valid enrichment to the written concepts, functioning as a useful translation and

simplification. For this reason, the operation of transmutation (adaptation) is fundamental; in my case it was carried out by the author himself, who has summarised and explained the chapters of his book.
During the production stage I have chosen to interview the author of the essay and make him visible, letting him explain in first person notions and arguments in order to allow the viewer to learn by an immediate and "warm" way.

During the post-production stage, as support to the words of the author, I have added images and sounds in order to complete the clips and offer a greater sensorial depth in the transmission of the scientific message. For almost all the disciplines (except the most technical ones, which require special solutions and reinterpretations) the popularisation by images in movement, enriched by soundtrack, enables a fascinating perceptive immersion.
This is one of the most important and at the same time delicate feature in the production of scientific audio-visuals: the balance between scientific accuracy and spectacularization. The ingredients used by the video-communicator during the construction and production of the clips (animations, graphics, repertoire images, music, sounds) have to be blended with competence, trying to enhance the potential artistic fascination of the language by images maintaining the scientific rigour. A video as such is called to use the multiple possibilities of its own language. Popularisation as such is called to properly convey scientific contents.

The choice to use short clip-videos responds to the possibility of a manifold fruition offered by new technologies. The process of hybridisation that is affecting the old mass-media (cinema, radio, TV) and the new communication and fruition tools (the Internet, portable mobile devices), open to sceneries where also different languages melt together and circulate through an ever-changing flow. The current digitalisation of books into e-books opens to a wider multimedia fruition of written contents. The possibility to integrate text with images, animations and short videos highlights the importance of knowing the audio-visual language for the popularisation of science.

In the near future the scenery that people interested in scientific knowledge will confront with, will be various and constituting of offers available in different degrees of elaboration. Besides books, which will keep representing an indissoluble totem of knowledge, there will be other channels of diffusion, often fragmented and short; among them the audio-visual will play a primary role.

The opportunities for the popularisers relying on video will be: to create *ad hoc* audio-visuals (for cinema, TV or the Internet), audio-visuals derived from scientific textbooks (as supplement to the book or directly on the Web) and audio-visuals that integrate e-book (on files directly available while reading). Within this articulated panorama the knowledge of forms, techniques and potentialities of the video will result fundamental in view of a valid, refined and stimulating scientific communication.

A

Appendix

A.1 Introduction

To further explore and understand the audio-visuals analysed in Chap. 4, I have realised a de-structuring decoupage through several tables. The first table helps to understand, for each film, its general shape by identifying the succession of sequences and two or more interwoven communivative levels.
The second table explores in details one or two video sequences by specifying the audiovisual grammar that has been used (frames, editing, music and sound) and highlighting the specific codes of each audio-visual.

A.2 The Film: *Mon Oncle d'Amerique*

A.2.1 Analysis of the Geneal Structure of the Film

N.	Title	A/V Language	Content	Length
1	**Names and dates**	Fiction + popularisation	Film credits. Introduction of 3 protagonists and Laborit alternated to the presentation of the "theory of conservation" by Laborit himself.	09.29 min
2	**A memory in action**	Fiction + popularisation	The 3 protagonists tell in first person about their first years of life. Laborit talks about the evolution of species: the theory of 3 brains.	03.34 min
3	**Childhood memories**	Fiction + popularisation	The 3 protagonists tell in first person about their childhood. Laborit continues the description of the 3 levels of the brain and of their 3 explicative channels.	04.54 min
4	**Youth memories**	Fiction + popularisation	The 3 protagonists tell in first person about their adolescence. Laborit explains the concept of memory. Indelible experiences that mark our nervous system.	03.48 min
5	**The escape**	Fiction + popularisation	The protagonists tell about the escape from their home countries. Laborit explains how the 3 brains work.	03.20 min
6	**The career**	Fiction + popularisation	The 3 protagonists tell about the development of their careers and the first time they came into contact with one another. Laborit explains the 4 principles of behaviour: consumption, gratification, reaction to punishment, inhibition.	07.32 min
7	**Career's incidents**	Fiction	To Ragueneau is assigned a new colleague who endangers his position in the company. Le Gall leaves his home, Jean welcomes him. Le Gall explains his ambitions. Acting.	08.34 min
8	**The hypocrisies**	Fiction	Le Gall shows the first tricks of the trade that cost him his job. Ragueneau and Le Gall have the first stress symptoms. Acting.	11.19 min
9	**The new charge**	Fiction	To Ragueneau is assigned a new charge and he is transferred. Altercation with his wife. Le Gall continues to have renal colics attacks. Janine stays close to him and takes care of him. Acting.	07.03 min
10	**Women at a crossroads**	Fiction	Janine meets Le Gall's ex-wife who declares to be terminally ill and begs him to let her husband come back home. Ragueneau greets his wife (who tells him she is pregnant) and goes to work. Janine leaves Le Gall. Acting.	06.34 min
11	**Rats in cage**	Fiction + popularisation	2 years after. Le Gall accidentally meets Janine on his childhood island. Laborit	09.06 min

			introduces the theory of the rats in the cage: first situation.	
12	**Language and education**	Popularisation	Laborit continues his explanation: the importance of language for the transmission of knowledge. The survival of the group is bound to the learning of what is necessary tin order to be happy in society. How to behave for the cohabitation within the group. Succession of visual examples.	02.50 min
13	**The alibi of language**	Fiction + Popularisation	Laborit: urges, automatisms and hierarchies disguised by language. Alternated images of Janine and Le Gall on the island and visual examples. Janine finds out the deception of Le Gall's wife.	05.17 min
14	**The inhibitions**	Fiction + Popularisation	Laborit continues with the theory of the rats in a cage: two situations. 1. Inhibition-anguish-infection (psychosomatic illness) and third situation. 2. Fight (action) – absence of pathological disorders. But social rules prevent the man from him a defensive violence. Visual examples from the lives of the 3 protagonists. When the aggressiveness cannot be addressed to others it is turn to one's self. Le Gall and Janine say bitterly goodbye to each other.	07.31 min
15	**The anguishes**	Fiction	Janine meets Ragueneau and reproaches him, as superior, for his scarce results at work. Ragueneau is demoted. He leaves angry. After a short talk on the phone with his wife he is offered a job in gastronomy but, he refuses irritated. He attempts to commit suicide in a hotel room. Janine is shocked.	15.59 min
16	**The explanations**	Fiction + popularization	Janine, shocked, reaches Le Gall but she only finds his wife, who explain to her the importance of the stability of her husband. Ragueneau recovers after a gastric lavage Janine reaches Le Gall, who engaged in hunting explains her the reasons of his return home. Janine reacts beating him. Laborit explains how individual personality is constituted and the origin of anguish. Mechanisms that establish the hierarchical scale of power. Dominion of one man on another one. Hardly things can change.	14.00 min

A.2.2 Analysis of the Sequence Number 11 of the Film.

	Voice / Dialogues	Video – Graphic	Music Sounds
1		White writing on black background: "Two years later. Thursday, October 4th, 1979."	
2		- M.C.S. Le Gall on a rowing boat headed towards "his" island (7sec.). - L.S. The island and the arrival of Le Gall (12 sec.) . - Pan. of Le Gall who gets off the boat and sees another docked boat (17 sec.). - Close-up on Le Gall who observes the boat (3 sec.). - Close-up on the boat (2 sec.). - Close-up on Le Gall walking away (6 sec.). - L.S. Island (12 sec.). -Mobile Staging (M.S.) of Le Gall walking across the trees (9 sec.). - Close-up on the rat inside the cage (2 sec.). - M.S. of Le Gall walking across the trees (10 sec.). - C.U. Janine on the beach (POV Le Gall). (5 sec.) - C.U. Rat (2 sec.) - C.U. Le Gall (recalling the rat). (2 sec.). - L.S. Janine on the beach turns to Le Gall (POV Le Gall) (4 sec.). - C.U. Le Gall moves (5 sec.). - C.U. The rat moves (2 sec.). - M.S. of Le Gall escaping across the trees (6 sec.).	Environment Siren sound Siren sound
3	*"Quando si prende un topo e lo si chiude in una gabbia a due scompartimenti - il cui spazio, cioè, è diviso da un tramezzo al centro del quale si trova una porta; e il pavimento della gabbia è percorso, ad intermittenza, dalla corrente elettrica: prima che la corrente elettrica venga immessa nella rete del pavimento, un segnale avvisa l'animale, che si trova nella gabbia, che quattro secondi dopo la corrente passerà, ma in partenza non lo sa. Se ne accorge in fretta. All'inizio è inquieto, ma quasi subito si accorge che c'è una porta aperta e si trasferisce nello spazio contiguo. La stessa cosa si ripeterà pochi secondi dopo, ma l'animale comprenderà egualmente molto in fretta che può evitare il castigo del piccolo shock elettrico alle zampe ripassando nello spazio della gabbia nel quale era prima.*	- Frontal C.U. Laborit gets a book from the shelf (4 sec.). - Approaching tracking on a laboratory corridor up to reach a cage (24 sec.). - Shot from on high of the cage (15 sec.). - 2 frontal shots in succession of the cage, close-up on the rat (17 sec.).	Siren sound Siren sound

	Questo animale, che subisce questa esperienza per una decina di minuti al giorno, durante sette giorni consecutivi, alla fine del settimo giorno sarà in condizioni perfette, in ottima salute: il suo pelo è liscio, non ha ipertensione arteriosa. Ha evitato la punizione tramite la fuga. E' stato bene. Ha mantenuto il suo equilibrio biologico."	- M.S. of a hand grabbing a rat from a cage full of rats, taking it to the lap caressing it (16 sec.). - C.U. The researcher looks at the cage (2 sec.). - M.C.S. Le Gall wearing a rat-mask leaves his wife (5 sec.). - M.C.S. Le Gall reaches and hugs Janine (7 sec.).	Siren sound
4	Ragueneau: "Su, andiamo!" Janine: "Jean!"	- M.L.S. Le Gall runs on the island (7 sec.). - M.C.S. Le Gall leaves his wife and moves out (8 sec.). - M.C.S. Janine moves out (5 sec.). - C.U. Rat in the cage passing from a compartment to another. (2 sec.) . - M.L.S.. Regeaneau moves out his parents home with his wife. (4 sec.). - M.L.S. Running rat inside the cage (2 sec.). - M.L.S. Le Gall running towards the boat (8 sec.). - L.S. Janine shouts to Le Gall and stops him (2 sec.).	Siren sound Environment
5	*Quello che è semplice per un topo in gabbia è molto più difficile per un uomo nel suo ambiente sociale. In particolare perché certe necessità sono state create da quel tipo di vita sociale,* *e questo sin dalla sua infanzia ed è raro che egli possa,* *per appagare i suoi bisogni,* *risolversi alla lotta* *quando la fuga non è efficace.*	- M.L.S. Janine runs towards Le Gall (3 sec.). - M.L.S. Janine carries a theatrical column, sees his mother coming and runs away (4 sec.). - M.L.S. Janine runs towards Le Gall (5 sec.). - C.U. Le Gall's wife, preventing him to step out (3 sec.). - C.U. Janine stops running (3 sec.). - C.U. The rat in the cage, still (2 sec.). - C.U. Le Gall (4 sec.). - C.U. Janine (4 sec.).	Environment
	"Come vedi non sono morta" "Avresti potuto darmi tue notizie" "Perché? Hai fatto altrettanto?" "Sei tu che mi hai lasciato, non io." "Avresti potuto scrivere, telefonare…" "Perché?" "Via non farmi il broncio, siamo nella tua isola tutti e due!" "E cosa ci vieni a fare nella mia isola?" "Avevi promesso di farmela visitare. Sta tranquillo non ti ruberò i tuoi ricordi."	- Shot/reverse shot: Le Gall and Janine, face to face (35 sec.).	

A. Appendix

6	*Quando due individui hanno progetti diversi, o uno stesso progetto ed entrano in competizione per realizzarlo, ci sarà un vincitore e uno sconfitto.*	- L.S. Le Gall and Janine walk along the beach on the island (14 sec.).	
7	Janine: "Intanto tu mi lasci uscire!" Le Gall: "No!" *Si stabilisce un potere di uno degli individui nei confronti dell'altro.* Regeneau:"O altrimenti si studia" *La ricerca del potere, in uno spazio che definiremo il territorio, è la base fondamentale di tutti i comportamenti umani. E questo, nella completa incoscienza delle motivazioni.*	- C.U. Janine and C.U. Le Gall (3 sec.). - M.C.S. Regeneau in his office, sitting at the desk he talks to a boy (3 sec.). - M.C.S. The standing boy listens to (2 sec.). - C.U. Le Galle as child (3 sec.). - C.U. Upside down turtle moves its legs (5 sec.). - L.S. Le Gall and Janine walk along the beach of the island (5 sec.).	Environment
8	Janine: "Passare la vita a recitare Julie? No, mille grazie. Ho voluto ripartire da zero. Un pubblicitario mi aveva fatto un'offerta: diventare stilista. Avevamo chiacchierato, pensava che io avessi delle idee. Le confezioni i tessuti, era cambiare completamente ambiente. Ma io ho sempre amato cambiare pelle. Ti stupisce? Lo so, l'industria fa un po' stronzo. Per i miei vecchi amici e per i tuoi. A me, al contrario, piace. Ho sempre amato guidare, andare all'estero…Ah, ho saputo del tuo successo alle elezioni, bravo. La tua isola ogni volta che venivo in questa zona, la vedevo dalla strada. E mi obbligava a pensare a te. Scommetto che era là che tuo nonno faceva arrostire i granchi." LeGalle: "Ti ricordi anche di questo? Se ne trovavano con la bassa marea. Ne arrivavano interi branchi. Verdi e rossi. Ne prendevo facilmente delle dozzine. Si cuocevano, li sgusciavamo e si mangiavano subito, bruciandosi le dita. I verdi sono meno buoni, meno pieni, i migliori erano i rossi. Ma ce n'erano soprattutto di verdi. "	- Backwards tracking shot. Le Gall and Janine walk along the beach of the island. From M.C.S to C.U. (50 sec.). - C.U. Blackened stones. (5 sec.). - C.U. Le Gall's profile turning his head (27 sec.).	Environment
9	*Non esiste, quindi, l'istinto della proprietà, come non esiste l'istinto del dominio.* *C'è semplicemente per il sistema nervoso di un individuo, la scoperta della sua necessità di conservare a propria disposizione una cosa o un essere che è altresì desiderato, invidiato da un altro essere…* *Ed egli sa, perché lo ha imparato, che in questa competizione, se egli vorrà conservare l'essere o la cosa a sua disposizione, dovrà dominare.*	- M.C.S. Le Gall as child cooks with his grandfather the crabs on the island (10 sec.). - C.U. Janine as child, held in her mum's arms. (4 sec.). - C.U. The child holding a doll (3 sec.). - C.U. Le Gall as child caressing a little dog (2 sec). - L.S. The island, a couple has an	Environment

		argument (4 sec.).	
10	Janine: "E' lassù che ti rifugiavi a leggere il re dell'oro?" LeGalle "No, non ci sei! Per leggere tranquillamente mi arrampicavo in cima ad un albero. Te lo faccio vedere. Mi avevano proibito di arrampicarmi sugli alberi. E allora, siccome si fidavano di me, e avevano torto, non passava loro per la testa l'idea di andarmi a cercare lassù. Era straordinario, non vedevo che il cielo. Qui, ero sicuro che ci fosse sepolto uno scrigno con un tesoro. Mi ero procurato un piccone e scavavo, cercavo. Ci passavo intere giornate. Sentivo sempre parlare di uno zio, un fratello di mia nonna, che era partito per l'America. Ero sicuro che sarebbe ritornato per dirmi dov'era nascosto. Per me il re dell'oro era lui, il mio zio d'America. Io lo cerco sempre!" Janine: "Hai cinque anni." LeGalle:"Ma il tesoro esiste è provato. E ce ne saranno degli altri! Tutte queste isole servivano da nascondiglio ai corsari e a filibustieri. Lo sai che sei la prima persona alla quale rivelo questi terribili segreti?"	- Le Gall walks on the island followed by Janine. The camera first follows, then anticipates them (34 sec.). - Lateral M.C.S. The two stand facing a precipice (20 sec.). - M.C.S. The precipice (3 sec.). - C.U. Janine (5 sec.). - C.U. Le Gall (7 sec.). - C.U. Janine makes a move to go back. The camera follows the movement (8 sec.). - C.U. Le Gall (4 sec.). - C. U. Janine (2 sec.). - C. U. Le Gall (4 sec.).	Environment

A.3 The Documentary: *From the Depth of the Soul*

A.3.1 Analysis of the General Structure of the Documentary

N.	Sequence title	Description	Length
1	**Introduction**	The filmmaker on foreground briefly introduces the documentary.	00.00–02.00
2	**The first years of life**	First fragmentary memories. Immersion into nature. The rock. The parents. The aversion for the classical disciplines and the need for a personal research.	02.00–10.02
3	**The dreams and the Red Book**	"Dealing with dreams means to become aware of one self". Auto-analysis and translation of emotions into images. These images and the text constituted the Red Book. Accounts by the daughters Gret and Agate on the Red Book and on the mysterious activities of their father.	10.02–16.50
4	**Spirituality against reality**	1918-1919. Experience as Commander at Chateaux d'Aix. Drawings to show how the Self operates. The Mandala as centre. The path leading to individuation. Neuroses of people of that time. "If big things go bad it is because the small ones go bad". That is, everyone's life.	16.50–21.00
5	**The trips with the family**	Accounts by the daughters Gret, Agate and by the nephew Lutz Neumann about the trips on sailing boat with their father. "We had to take ourselves seriously even while playing". Four weeks in tent on the island. Contact with nature. Jung told legends around the fire.	21.00–25.20
6	**The importance of concreteness**	Construction of the house-tower and a monument at Bollingen, inspired to a primitive hut. Idea of totality. Spectres, corpse found beneath the house. Water and sculpture as tangible signs of spiritual realisation, the importance of hand working.	25.20–37.20
7	**Archetypes and e alchemy**	Meeting at Eranos: comparison with other scientific disciplines. Jung is ahead of the times and he is often misjudged. Enunciation of the meaning of archetype. Study of alchemy.	37.20–43.00
8	**Illness and spiritual healing**	Fracture of one leg and heart attack. In a state of unconsciousness Jung is delirious and has visions. Spiritual and extra-corporeal visions. After the illness comes a fruitful period of work. Life as a fragment of existence. Man oriented towards the infinite. The mister of love.	43.00–50.50
9	**The end of earthly existence**	Death of Jung. His intuitions are probably not fully grasped yet. Accounts on his last hours of life.	50.50–53.00

A.3.2 Analysis of the First Two Sequences of the Documentary

Time	Narrating Voice	Graphic-Video	Music-Sounds
00.00 02.00 A Level	"L'acqua, simbolo prediletto dell'inconscio è un tema centrale nella vita di C.G.Jung. Lo ha infatti sorretto, seguito e ispirato durante tutta la vita. Un nipote del grande psicoanalista svizzero, analista pure lui D. Bauman, mi ha fatto notare alcune curiose coincidenze. Jung è nato lungo le rive del lago di Costanza e poi nella prima parte dell'esistenza si è lasciato andare lungo la corrente del fiume. Sembra avviato verso una tranquilla, fin troppo tranquilla, carriera accademica. Ma a Basilea Jung, ha cominciato a nuotare da solo, controcorrente, alla ricerca delle limpide fonti della propria esistenza. Nella parte finale della sua vita, giunto sulle rive del lago di Zurigo, Jung ha tratto dalla profondità della propria anima alcune riflessioni fondamentali per la comprensione della psiche umana."	Staging shot. M.C.S. The director looks at the camera. Lake in the background (2 Min.).	Sounds from the environment.
02.00 02.36 B Level	*La storia di una vita comincia da un punto qualsiasi, da un qualche dettaglio che per caso ci capita di ricordare. E a quel punto essa era già molto complessa.* *Noi non sappiamo cosa sarà la vita, perciò la storia non avrà inizio e solo vagamente se ne può arguire la meta.*	- Title and direction on a body of water with a fish moving slowly (12 sec.). - Fade-in photo of Jung's face approaching (10 sec). - Fade-in frame of a body of water reflecting the sky (10 sec.).	Electronic music. Few dilated notes. Water sound in the background.
02.36 03.31 B Level	*Il ricordo dei fatti esteriori della mia esistenza si è in gran parte sbiadito o è svanito nel nulla.* *Ma i miei incontri con l'altra realtà, gli scontri con l'inconscio, si sono impressi in modo indelebile nella mia memoria.* *Ogni altra cosa al confronto ha perduto importanza.* *Posso comprendere me stesso solo in rapporto alle vicende interiori, sono queste che hanno caratterizzato la mia vita.* *Ecco perché parlo principalmente di queste esperienze. I sogni e le fantasie costituiscono parimenti la materia prima della mia attività scientifica sono stati per me il magma incandescente dal quale cristallizzandosi la pietra che deve essere scolpita.*	- Shot on a body of water reflecting the branches of a tree (10 sec.). - Fade-in frame of a meditating woman (7 sec.). - Fade-in body of water reflecting the branches of a tree (11 sec.). - Fade-in frame of eyes with a tear in the middle of the green (6 sec.). -Fade-in body of water reflecting the branches of a tree (5 sec.). - Fade-in frame of close-up of a meditating woman (6sec.). - Fade-in images of flowing lava (10 sec.).	A single prolonged note, enriched by some environmental sounds (water, wind, twitter).
03.34 03.40	Absent.	- Fade-in C.U. of a red stone (4 sec.). -Fade-in a picture	Music turns up and with it the sound of wind

A. Appendix

B Level		symbolising a circular labyrinth approaching (5 sec.).	too.
03.40 04.19 B Level	*I miei ricordi risalgono al secondo o al terzo anno di vita. Ricordi frammentari, slegati, senza un nesso apparente,* *fluttuanti in un mare di incertezze. Soffrivo di indefinibili angosce notturne percepivo presenze oscure. Si udiva sempre lo scroscio sordo delle cascate del Reno intorno alle quali era una zona di pericolo. Molti vi annegavano e i loro corpi erano trascinati via dalla corrente.*	-Picture symbolising a circular labyrinth approaching (9 sec.). -Fading on 4 frames in succession: waterfalls, water, vapour, fast stream (25 sec.).	After a few seconds music leaves space to the roar of water.
04.19- 04.53 B Level	*Nel nostro giardino sporgeva un masso, era la mia pietra.* *Spesso, quando ero solo, andavo a sedermi su quella pietra e cominciava allora un gioco fantastico, pressappoco di questo genere:* *"Sono io quello seduto sulla pietra o sono la pietra sulla quale Egli siede?"* *Non nutrivo dubbi che la pietra fosse in qualche oscuro rapporto con me e potevo restarci seduto per ore affascinato dal suo enigma.*	-Fade-in frame of Jung as a child, C.U. (3 sec.). -Fade-in approaching frame of a rock emerging from the ground (13 sec.). -Fade -in a detail of the photo of Jung as child (3 sec.). -Fade-in approaching frame of a rock emerging from the ground (13 sec.).	The sound of water blurs into the sounds of the garden with the stone (twitter).
04.53- 05.27 B Level	*La pietra non ha incertezze, non ha bisogno di esprimersi ed è eterna, pensavo, mentre io sono solo un fenomeno passeggero che si consuma in emozioni di ogni genere. Come una fiamma che divampa rapidamente e poi si spegne. Io ero solo la somma delle mie emozioni e qualcos'altro in me era la pietra senza tempo. Ero costantemente alla ricerca di qualche cosa di misterioso.*	- B.C.U. 11 Successive frames of rocks (3-4 sec. each frame).	The environmental sounds blur into keyboard music of a few prolonged notes.
05.27 05.49 B Lev.	*Mi immergevo nella natura e quasi mi confondevo nella sua stessa essenza, fuori dal mondo degli uomini.* *Oggi come allora sono un solitario, perché conosco e intuisco cose che gli altri ignorano e di solito preferiscono ignorare.*	- B.C.U. Blades of grass (3 sec.). - C.U. Blades of grass (4 sec.). - Cut on approaching photo of elderly Jung (17 sec.).	Keyboard music with few prolonged notes.
05.49 06.06 A Level	*Il matrimonio dei miei genitori fu una prova di sopportazione irta di difficoltà.* *Entrambi facevano gli errori tipici di molte coppie.* *La mamma era una ottima madre ma sono sicuro che in lei ci fossero due personalità.*	-Fade-in a detail of a family picture (3 sec.). - Cut on the entire family photograph (4 sec.). - Cut on the detail of the mother in the photograph (7 sec.).	No music or sounds.
06.06 06.35	*Una innocua, umana e l'altra inquietante spietata. Spietata come la verità e la natura.* *Anch'io posseggo questa natura arcaica che in me si combina con il dono, non sempre*	- Fade-in still photo of spiral clouds that form a tunnel (5 sec.). - Fade-in still frame on a river	Keyboard music with prolonged notes that towards the end becomes

B Level	*piacevole,* *di vedere la gente e le cose come realmente sono.*	that flows slow (16 sec.). - Fade-in approaching photo of elderly Jung in close-up (6 sec.).	increasingly syncopated.
06.3 507.17 A-B Level	*A 14 anni, durante le vacanze ai piedi del Rigi, mio padre mi mise in mano un biglietto e mi disse: "Puoi andare sulla cima da solo." Ero sena parole per la felicità. La locomotiva cominciò ad arrampicarsi verso altezze vertiginose, dove abissi e paesaggi sempre mutevoli si spalancarono ai miei occhi. Finche alla fine giunsi sulla cima e lì, in quell'aria insolitamente leggera contemplai inimmaginabili lontananze.*	- Fade-in of frame of landscape filmed from a train (22 sec.). - Frame of clouds in the sky (3 sec.). -Pan shot of the landscape (17 sec.).	Music blurring into the noise of the train and environmental sounds.
07.17 07.49 B Level	*Si, è questo il mio mondo pensai. Il vero mondo, quello segreto, dove non vi sono insegnanti e scuole e dove uno può Essere senza dover chiedere nulla. Tutto era molto solenne e avvertivo la necessità di essere gentile e silenzioso perché mi trovavo nel mondo di Dio. Qui il suo mondo era tangibile.*	- Fade-in on 3 consequential frames of sky and clouds (10 sec. each).	Baritone chorus and keyboard music.
07.49 08.02 A Level	V.o. in terza persona: "A vent'anni, quando studia medicina a Basilea, Jung prova già un profondo disagio di fronte alle vie battute. Anche il peso opprimente della tradizione, in questa città, gli riesce insopportabile."	- Cut on a photo of Jung on boat with friends (4 sec.). - Fading on a group photograph: Jung and other colleagues (5 sec.). - Fading on photo of Jung (5 sec.).	Dissolving music.
08.02 08.23 A Level	Jung compie la propria scelta professionale dopo la lettura di un manuale di psichiatria di Krafft Ebing. Finalmente, trova un campo di esperienza che raccoglie fatti biologici e spirituali, alla ricerca di quel legame tra psiche e corpo che era stato finora il tema centrale della sua vita.	- Staging shot from beneath of a cathedral (3 sec.). - 3 staging shot of a flowing river (7-10 sec. each).	Music recalling the main music theme. Electronic keyboards. Long notes.
08.23 08.55 (Level A)	Jung, comincia così a nuotare controcorrente fedele alla propria stella. Studia la psichiatria, materia a quel tempo ancora poco considerata.	- Fading on staging shot reflection of the sun on a body of water (30 sec.).	Electronic keyboard, long dilated notes. Main music theme.
08.55- 09.40 (Level B)	*I miei interessi e le ricerche erano dominati da un grave problema:* *che accade realmente nei malati di mente? Era una cosa che non riuscivo allora ancora a capire e alla quale nessuno dei miei colleghi si era mai interessato. In quel momento Freud fu per me di vitale importanza, specialmente a causa delle sue fondamentali ricerche su*	- Photo of a labyrinth (3 sec.). - Fading on 4 pictures of paintings (Jawlensky) of desperate faces approaching (5 sec. each).	Electronic keyboard, long dilated notes. Main music theme. Distorted sounds in the background.

A. Appendix

	psicologia, isteria e sogni. Grazie al mio lavoro con i pazienti mi resi conto che idee ossessive e allucinazioni contengono un nocciolo significativo, nascondono una personalità. La storia di una vita, paure, speranze, desideri.	- 5 still details of the paintings (4 sec. each).	
09.40-10.02 (Level B)	*In un primo tempo avevo aderito all'opinione di Freud secondo cui nell'inconscio si trovano residui di vecchie esperienze. La mia esperienza reale dell'inconscio mi induceva invece a ritenere che questi residui non sono affatto forme morte ma appartengono alla psiche vivente. Presto, mi resi conto che come base per l'interpretazione era giusto prendere i sogni per quello che sono, è quello il loro scopo. Costituiscono la realtà di fatto dalla quale dobbiamo partire.*	- 5 still details of the paintings. Disturbing images of pain and madness (5 sec. each).	Electronic keyboard, long dilated notes.

A.4 The TV Programme: *Il Corpo Umano, il Cuore*

A.4.1 Analysis of the Geneal Structure of the TV Programme

N	Sequence title	Description	Length
1	**Introduction**	The anchor-man in studio introduces the topic about heart and provides some data (heart beats 3 billion times, it pumps 200 million litres of blood, etc.). Components of heart.	00.00–3.36
2	**The mitral valve**	From the inside of the heart the correspondent explains the functioning of valve, atria, tendons and blood flow. Incorrect functioning of the valve and related interventions. Potential infections.	03.36–08.20
3	**The circulatory system**	The anchor-man in studio introduces the circulatory system. The flow is explained through animation videos and voice-over (example of rivers an lakes). The correspondent straddling a red blood cell is within the arterial web. Concept of arteriosclerosis and function of heart as feeding pump.	08.20–12.20
4	**Adaptation mechanism**	The anchor-man in studio, with overlay animations, explains how different circumstances produce different consumptions and therefore different heart pumping. Automatic mechanism of adaptation.	12.20 –14.20
5	**Why does heart beat?**	The correspondent is inside the arterial knot and, interacting with the presenter, shows and explains the origin of cardiac pulsations. Nervous impulses. The extra-systoles is displayed in an external filmed document showing the anticipated beat.	14.20–18.30
6	**Heart in ancient Egypt**	The anchor-man between two Egyptian statues explains the importance of (the) heart in ancient Egypt.	18.30-20.25
7	**Heart and emotions**	To a woman in studio (provided with electrodes recording her beat) are shown different kinds of pictures. The attention is drawn to the changes of pulsation. An external contribute explains the relation between heart and brain through animated graphic. Example of the launch of shuttle Apollo 9.	20.25-28.09
8	**Other models of heart**	Each species adopts different solutions in order to respond to different needs. Filmed contribution with voice-over on animal species and their heart.	28.09 –31.50
9	**The risks for heart**	The anchor-man in studio explains through photos the risks of a bad heart “maintenance”. Fat plaques obstructing an artery. The cholesterol is explained by a filmed contribution with animations and voice-over.	31.50-36.50
10	**Ischaemias and occlusions**	The anchor-man in studio talks about ischaemias and silent ischeamias. The correspondent, swimming along an artery shows the streaked walls with fat plaques and an occlusion.	36.50-41.30
11	**The bypass intervention**	External contribution consisting of graphic animation and voice-over.	41.30-42.30

12	**The heart attack**	The anchor-man explains what worsens the occlusions (smoke, fats, etc.). An animation with voice-over shows the heart-attack and the possible treatments.	42.30-45.30
13	**The lose cannons: the heart-attack**	The correspondent shows one of the possible loose cannon: a small blood clot. An animation, accompanying the words of the anchor-man, shows what happens when a blood clot is formed. It is finally explained the ictus and the paralyses.	45.30-53.15
14	**New horizons of intervention**	An external contribution shows a new kind of intervention to remove the fat plaques in the arteries. "Intelligent pills".	53.15-56.10
15	**Conclusions**	The correspondent comes out the human body and familiarises with his alter-ego. They greet each other.	56.10-59.00

A.4.2 Analysis of the Sequence n. 3: The Circulatory Sistem

	Time	**Voice**	**Graphic-Video**	**Music-Sounds**
1	50 sec.	Il sangue quando esce dal cuore entra in una rete circolatoria davvero sterminata. Qualcuno ha calcolato che se si mettessero in fila tutte le arterie, arteriole, capillari, vene si arriverebbe a una rete lunga 100 mila Km. Il nostro sistema circolatorio, in altre parole, è lungo due volte il giro del mondo. Naturalmente il diametro, cioè la larghezza di questi vasi, varia enormemente: da 2-3 cm a qualche millesimo di millimetro. E' più o meno la differenza che passa tra uno spillo e un tunnel ferroviario. Anche la velocità di scorrimento del sangue di conseguenza cambia. Vediamo questa animazione.	- M.C.S. Piero Angela sitting at the a workplace full of buttons and screens (20 sec.). - M.L.S. Piero Angela's left side (20 sec.). - Fade-in animation of running red blood cells (10 sec.).	Voice of the anchor-man in studio. No sound effects or music.
2	1 min.	*Per capire questo concetto basta fare l'esempio del lago e dei fiumi.* *Un fiume in entrata ha una notevole velocità e così quello in uscita, ma l'acqua nel lago si muove molto lentamente.* *Ebbene, le arteriole e ancor più i capillari, sono proprio come un lago dove il movimento è lento e riprende poi velocità quando confluisce nelle vene per tornare al cuore.* *E' questo il meccanismo che consente ai capillari di portare ai tessuti il nutrimento e l'ossigeno ad un ritmo lento per permetterne l'assorbimento.* *Un'arma segreta della circolazione è la capacità delle arteriole di dilatarsi e*	-Fade-in animation of rivers and lake. Frame of river (15 sec.) - Fade-in animation of the circulatory system. Arterioles and capillaries recall the structure of the lake (15 sec.). - Repeating fade on capillaries and arterioles details (30 sec.).	Descriptive voice-over. Electronic music that emphasises the most important passages of the explanation.

		restringersi grazie alla loro muscolatura. *Esse possono in questo modo regolare il flusso sanguigno e soprattutto, come dei semafori intelligenti, distribuirlo maggiormente nelle zone che più lo richiedono.*		
3	30 sec.	Vi proponiamo ora di entrare in questo straordinario sistema circolatorio. Naturalmente in maniera immaginativa. Abbiamo cercato di ricostruire nel modo migliore questi ambienti con una piccola differenza: nella realtà i globuli rossi sono ben 5 milioni per millimetro cubo. Noi li abbiamo rarefatti altrimenti non saremmo più riusciti a vedere neanche il nostro inviato che ha molte cose interessanti da raccontarci.	- M.L.S. Position on Piero Angela's left side .(10 sec.) - M.C.S Piero Angela sitting at the workplace full of buttons and screens (20 sec.).	Voice of the anchor-man in studio. No sound effects or music.
4	40 sec.	Se noi potessimo viaggiare all'interno della rete arteriosa è più o meno questo il paesaggio che vedremmo. Una lunghissima serie di tunnel con biforcazioni molto frequenti. Noi stiamo andando a piccola velocità per capire meglio le cose. Uno dei punti più importanti di tutto il discorso che faremo in seguito è lo stato di queste pareti. Qui le vediamo lisce e pulite, il sangue può così scorrere senza intoppi per portare a tutto l'organismo l'ossigeno e il nutrimento di cui ha bisogno. Se potessimo mantenere queste pareti così pulite per tutta la vita eviteremmo molti problemi di salute.	- Fade-in Angela. M.L.S. Inner of artery (40 sec.).	Correspondent's voice. Classical music in the background.
5	4 sec.	Problemi cardiaci?	- F.S. Piero Angela sitting at his position looking at the screens where the displaying correspondent (4 sec.).	Voice of the anchor man. Classical music in the background.
6	10 sec.	Non soltanto problemi cardiaci ma disturbi in tante altre parti del corpo. A cominciare dal cervello che funziona meno bene se queste arterie si inspessiscono o si induriscono.	- M.L.S. Fade-in Angela inside an artery saddling a red blood cell (5 sec.). - Fade C.U. Angela (5 sec.).	Correspondent's voice. Classical music in the background.
7	10 sec.	Ed è così che si forma la famosa sclerosi dell'arteria o arteriosclerosi. Tra l'altro bisogna dire che il cervello è un grande consumatore di ossigeno e di glucosio.	- M.C.S Piero Angela sitting at his position looking at the correspondent (10 sec.).	Anchor-man's voice. Classical music in the background.
8	25 sec.	Si, un grandissimo consumatore ma è un discorso che, sia pure in tono minore, vale per tutti gli altri organi. Questo è il trenino che porta in giro i rifornimenti a tutto il corpo. Se questo convoglio non viaggia bene o solo pochi vagoni riescono a passare, a destinazione non arrivano più abbastanza nutrimento ed energia.	- M.C.S fade-in Angela inside an artery saddling a red blood cell (25 sec.).	Correspondent's voice. Classical music in the background.

A. Appendix

9	10 sec.	Già… Questo è appunto il discorso di base. La funzione del cuore in definitiva, è quella di pompare nutrimento e ossigeno a tutto il corpo a seconda dei bisogni e delle richieste.	- Fade-in Angela in studio, standing up and heading to another area of the studio (10 sec.).	Anchor-man's voice in studio. No sounds effects or music.

A.5 Web Video: *The Origin of Pleasure*

A.5.1 Analysis of the General Structure

N	Title	A/V Language	Content	Length
1	**Introduction**	Speaker + Slides	The psychologist Paul Bloom by a single sentence presents the topic of the conference and to introduce the lecture "The Origins of Pleasure", tells an anecdote referring to a forger. Van Meegeren and Hermann Goering (Hitler executive officer).	03.00 min
2	**Key question**	Speaker + Slides	The speaker formulates the first questions he will have to answer. Why it is so important to own the original version of a piece of art? The status symbol is not enough.	01.06 min
3	**Believes**	Speaker + Slides	Human reactions are shaped by believes. Not only for what concerns art. Examples: steaks, milk for kids, wine, sexual images. Conclusion: if you like something, it will then result to you more beautiful.	03.20 min
4	**The Capgras Syndrome**	Speaker + Slides	Bloom tells about the case of a woman suffering from the Capgras syndrome (to be convinced that the people we love do have a clone), who being convinced to have to do with her husband double, experienced a greater sexual satisfaction.	00.50 min
5	**Tennis, Rubber, Shoes**	Speaker + Slides	Three more anecdotes to corroborate the thesis that the history of objects determines their value. In sequence are shown the club that was once owned by Kennedy, the chewing gum of Britney Spears and the shoe hurled against Bush during a press conference. Personal objects are irreplaceable due their history.	01.10 min
6	**Clooney's sweater**	Speaker + Slides	Bloom accounts for the experiment done by asking people about the value they attributed to a sweater wore by George Clooney. The way the value changes if this sweater cannot be displayed, sold again or if it is washed.	
7	**Chagall, Pollock and Maria Olmstead**	Speaker + Slides	An "original" is the conclusion of a creative act, a false version is not. Bloom does a survey among the public in order to know who appreciate the works of Pollock and who do not. Afterwards he assimilates the art of Pollock to the one of Olmstead, a	02.00 min

			three-year-old girl. When a TV programme revealed that her works were realised with the help of her father, the millionaire quotations of her paintings have been reset. It was physically the same art but the history had changed.	
8	**Joshua Bell and John Cage**	Speaker + Slides	Experiment of making an internationally renowned violin player exhibiting inside a tube station. He is barely considered. Anecdote of a woman who recognises him. The second example is the case of the mute song by John Cage sold for 1.99 dollars on iTunes.	01.50 min
9	**The perception of pain**	Speaker + Slides	Description of an experiment where a device gives painful electric shocks to some subjects. Their perception of pain changes if they know that the impulses are sent intentionally or accidentally. The pain is sharper when it is thought to be inferred voluntarily. But someone also looks for small doses of controlled pain (hot pepper or roller coasters). The conference closes with a statement by John Milton: *"Mind is a separate place. It can turn paradise into hell and hell into paradise."*	02.20 min

A.6 DVD: The Pre-Socratics and the Birth of Philosopy

A.6.1 Analysis of the General Structure

N	Title	A/V Language	Content	Length
1	**Western world**	Frontal lecture	Area of analysis: Western world. Science and technique against ideologies. Search for truth.	06.34 min
2	**First thinkers**	External contribution	The origins of philosophy. The first thinkers. Use of rationality to know the truth and understand things. Miletus-Ionia. The myth. The pre-Socratics.	03.21 min
3	**Search for truth**	Frontal lecture	Concept of truth arose by the first Greek thinkers. Introduction to the concept of myth.	03.47 min
4	**The myth**	External contribution	Origin of the myth. Legendary stories on incomprehensible phenomena.	02.00 min
5	**The value of myth**	Frontal lecture	The myth consists in the invention of a divine meaning by which human being feels to be protected against pain and death.	02.20 min
6	**From myth to philosophy**	Frontal lecture	Philosophy consists in the will to look at the truth going beyond the myth.	02.40 min
7	**For the sake of knowledge?**	Frontal lecture	Will to account for what is evident. Putting into light or finding the "light" to take on real remedies.	06.38 min
8	**The search for Archè**	External contribution	The pre-Socratics. Rational explanation of the physical world and primary principle: the Archè. Thales, Anaximander, Anaximenes, Heraclitus. School of Elea: Parmenides.	03.44 min
9	**The Greek meaning of truth**	Frontal lecture	Truth seen as knowledge that nothing can controvert. Knowledge to which Greek thinkers aspire.	06.48 min
10	**Thales from Miletus**	External contribution	Life of Thales. Thales as philosopher: the principle of things. Water as the unifying principle.	02.30 min
11	**The principle of everything**	Frontal lecture	Explanation of Thales's thought. Concept of principle of things, and totality.	03.08 min
12	**Water: a philosophical principle**	Frontal lecture	Water as the pooling element of everything. Water is the attempt to point to something that unifies things.	04.22 min
13	**The absolute nothingness and death**	Frontal lecture	For the first time the philosophers introduce the concept of nothingness and the one of death, that is linked to	04.01 min

A. Appendix

			it.	
14	**The supreme remedy**	Frontal lecture	What is not subordinated to death and is always save, represents the supreme remedy.	02.30 min
15	**Heraclitus from Ephesus**	External contribution	Life of Heraclitus. Heraclitus's thought: the becoming, opposition between contraries, logos and fire.	02.23 min
16	**The fight between contraries**	Frontal lecture	Everything is what it is only if in opposition to other things. Common element of everything. War.	03.47 min
17	**Heraclitus: fragments**	External contribution	Six aphorisms of Heraclitus from Ephesus.	01.40 min
18	**Parmenides from Elea**	External contribution	Life of Parmenides. Parmineides Theories and works. Rational interpretation of the truth. Logical-rational approach.	03.07 min
18	**The being is, the nothingness is not**	Frontal lecture	Everything is a non-nothingness and therefore everything do exist. Parmenides is blinded by the Being.	03.32 min
20	**The world is an illusion**	Frontal lecture	Exploration of Parmenides's thought. World is an illusionary opinion.	04.43 min
21	**Parmenides: fragments**	External contribution	Four aphorisms of Parmenides.	01.33 min
22	**Beyond Parmenides**	Frontal lecture	If illusion does exist, as recognised by the same Parmenides, truth is smashed. External world and principle according which the being is not the nothingness.	05.15 min
23	**Parmenides: fragments**	External contribution	Five aphorisms by Parmenides.	01.51 min
24	**Conclusion: the evolution of Western thought**	Frontal lecture	The philosophical thought sheds light on the chessboard where the games of the West will take place. Conclusion of the lecture and hints to the future of philosophy after Parmenides.	07.42 min

A.6.2 Analysis of the Sequence: Frontal Lecture

Scene	Time	Voice	Graphic-Video	Music Sounds
1	10 sec.	Absent	Overlay writing: *The birth of philosophy:- the value of myth.* On unfocused background with fresco.	Slow piano music.
2	10 sec.	*Myth refers to that set of perspectives leading human life since its beginning. A life not merely consisting in providing the tools and techniques to survive.*	- M.L.S. Severino sits at a table, holding a pen in his hand.	Voice of Severino only.
3	20 sec.	*The myth constructs techniques and instruments meant to defend from the threats of life, but this defence is acted within a process of meaning production.*	- Cut on C.U. Severino, sitting and holding a pen, continues the narration.	Voice of Severino only.
4	21 sec.	*Divine sense of the world by which man feels protected against the threat of pain and death. This is not an ordinary issue. This is a fundamental topic for us. In any moment we mean this: to be set free or temporarily saved from pain and death.*	- Cut on M.L.S. Severino sits, holding the pen.	Voice of Severino only.
5	9 sec.	*When pain hits us, we hope it will not come back.*	- Cut on C.U. Severino sitting, continues the narration.	Voice of Severino only.
6	14 sec.	*We are talking about a matter that is of most interest and that since ever has been of most interest for the human kind: pain and death. And the remedy to pain and death.*	- Quick fade-in a detail. Eyes of Severino.	Voice of Severino only.
7	21 sec.	*It is inevitable that at a certain point man relises to be not satisfied by the remedy offered by myth.*	- Fade on M.L.S. Severino sitting, holding the pen.	Voice of Severino only.

A.6.3 Analysis of the Sequence: External Contribute

Time	Narrating voice	Graphic-Video	Music Sounds
10 sec.	Absent	Overlay sign on unfocused background with fresco: *The birth of philosophy – the Search for Archè* .	Slow piano music. Leit-motive of the entire video.
19 sec.	The term "pre-Socratics" is usually used to designate that group of Greek thinkers who have been living before Socrates, between the VI and V century BC.	- Approaching shot on the fresco: the School of Athens" by Raffaello. - Two overlaying concepts: pre-Socratics and VI and V century BC.	Slow piano music. Leit-motive of the entire.
16 sec.	These first philosophers arose the issue about the rational explanation of the physical world and the individuation of its ruling principle: the Archè. That original unit that represents the primary substance and that defines the laws of everything.	- Panoramic fading on a detail of the fresco. - 3 overlaying key concepts: Archè, unity, law of everything.	Slow piano music. Leit-motive. Leit-motive of the entire.
20 sec.	Among the names of these thinkers we first of all find Thales, the initiator of the School of Miletus, considered the first philosopher in Western history. The one who first arose the question about the origin, of everything the Archè.	- The bust of Thales that shows the map of Greece. - Fade-in black starry background approaching. - Three overlaying concepts: Thales, the School of Miletus.	Slow piano music. Leit-motive of the entire video.
6 sec.	Thales found this principle in water, wherein everything comes and to which everything returns.	- Fade-in sea weaves to the fore. - One overlay key concept: water.	Slow piano music. Leit-motive of the entire video.
27 sec.	Anaximander, Thales student, made a step towards a greater abstraction by locating the principle not in a concrete element, but in something not determined as the "Apeiron". Only an undetermined origin, according to this philosopher, can assume the different determined forms that we see in the things of the world.	- Fade-in from black to a detail of the fresco "The School of Athens" that becomes grey leaving in colour only Anaximander - Fade-in water flowing horizontally - Fade-in lights blurring into blue. - In overlay: Anaximander, the non- determined, the Apeiron.	Slow piano music. Leit-motive of the entire video.
22 sec.	With a similar attitude to research, Anaximenes, from Miletus too, individuates in the air the common principle of everything, which through rarefaction turns into fire and after condensation turns into water and into earth. The air is invisible, infinite and life depends on air.	- Fade-in the face of the bust of Anaximenes approaching. - Fade-in clouds approaching. - Fade-in mountainous landscape with lightings. - Fade-in a detail of a flooded garden by rain and on clouds and rain.	Slow piano music. Leit-motive of the entire video.

		-In overlay: Anaximenes, the Air.	
15 sec.	Nowadays the reflections of these men can surprise for their simplicity but the power they are imbued with relies on the absolutely new idea for the culture of that time that everything is originated and ruled by the same principle and on the method adopted to explain this.	- Fade-in from black bust face approaching. - Fade-in a detail of the face. - Fade-in moving close-up of another face. - In overlay: The idea, a unique origin.	Slow piano music. Leit-motive of the entire video.
14 sec.	Each of them needs to argue his own theories by a logic way, distancing themselves from superstitions. This extraordinary revolution is the foundation of Western culture.	- Fade-in a close-up bust face moving away. - Fade-in a detail of eyes of another bust approaching. - In overlay: the revolution.	Slow piano music. Leit-motive of the entire video.
28 sec.	Heraclitus from Ephesus completes and surpasses the previous philosophers. He is considered the philosopher of becoming. Reality, according to Heraclitus, is ever changing: everything changes, flows, panta rhei. The becoming is possible since there are contraries in constant opposition.	- Fade-in from black on approaching detail of Heraclitus in the fresco "The School of Athens" (Heraclitus in colour while the rest in b/w). - Fade-in a detail of rough sea. - Fade-in a detail of flames. - In overlay: Heraclitus the philosopher in progress, Panta Rhei, the contraries.	Slow piano music. Leit-motive of the entire video.
10 sec.	At the beginning of the V century BC another important philosophical school arose in Elea, a Greek colony of the ancient Lucania.	- Fading from black on a map of Mediterranean sea with a red circle pointing to Elea. - In overlay: V century, Elea.	Slow piano music. Leit-motive of the entire video.
9 sec.	The founder of the school, and its greatest representative was Parmenides, who devoted to the study of the Being.	- Fade-in a detail in vertical panoramic of Parmenides in the fresco "The School of Athens" (Parmenides remains in colours while the rest is in b/w). - In overlay: Parmenides	Slow piano music. Leit-motive of the entire video.
20 sec.	A unique, eternal and immutable being, in contrast with the illusionary world of the senses. Parmenides is also known as the philosopher of the Being.	- Fade-in from black starry approaching. - In overlay: a unique being, eternal immutable. The philosopher of the Being.	Slow piano music. Leit-motive of the entire video.

Bibliography

Albano L. (2004), *Lo schermo dei sogni*, Marsilio, Venezia.

Age (2004), *Scriviamo un film*, Net, Milano.

Anania F. (1997), *Davanti allo schermo. Storia del pubblico televisivo*, Carocci, Roma.

Angela P. (1998), *Raccontare la scienza*, Pratiche, Milano.

Angelini A. (1992), *Psicologia del cinema*, Liguori, Napoli.

Apolloni U. (2002), *Scienza e ricerca: conquiste, sfide e dilemmi*, Rubettino, Soveria.

Aumont J. (2007), *L'immagine*, Lindau, Torino.

Aumont J., Bergala A., Marie M., Vemet M., (1999), *Estetica del film*, Lindau, Torino.

Battisti C. (2008), *La traduzione filmica*, Ombre corte, Verona.

Bazin A. (1973), *Che cosa è il cinema*, Garzanti, Milano.

Bertozzi M. (2008), *Storia del documentario italiano*, Marsilio, Milano.

Bettetini G., Braga P., Fumagalli A., (2004), *Le logiche della televisione*, Franco Angeli, Milano.

Bettetini G., Grasso A., (1988), *Lo specchio sporco della televisione*, Fondazione Agnelli, Torino.

Bolter D., Grusin R., (2007), *Remediation*, Guerini, Milano.

Bordwell D., Thompson K., (2005), *Storia del cinema e dei film*, Il Castoro, Roma.

Bruno M. W. (1994), *Neotelevisione*, Rubettino, Soveria.

Buccheri V. (2010), *Lo stile cinematografico*, Carocci, Roma.

Bucchi M. (2000), *Scienza e società*, Il Mulino, Bologna.

Burch N. (2001), *Il lucernario dell'infinito*, Il Castoro, Roma.

Campanella T. (2003), *La città del sole*, Feltrinelli, Milano.

Campari R. (2008), *Sogni di celluloide*, Marsilio, Venezia.

Carrada G. (2005), *Comunicare la scienza. Kit di sopravvivenza per ricercatori*, Sironi, Milano.

Casetti (1993), *Teorie del cinema* (1945-1990), Bompiani, Milano.

Casetti F., (1986), *Dentro lo sguardo. Il film e il suo spettatore*, Bompiani, Milano.

Casetti F., Di Chio F., (1994), *Analisi del film*, Bompiani, Milano.

Cassani D. (2000), *Manuale del montaggio*, Utet, Torino.

Castelfranchi Y., Pitrelli N. (2007), *Come si comunica la scienza*?, Laterza, Bari – Roma.

Chardère B., G. Borgé (1986), *I Lumière, l'invenzione del cinema*, Marsilio, Milano

Chatman S. (2010), *Storia e discorso*, Saggiatore, Milano.

Chion M. (1997), *L'audiovisione, suono e immagine nel cinema*, Lindau, Torino.

Cloitre M., Shinn T., (1985), *Expository practice: social, cognitive and epistemological linkages*.

Coassin G., (2011) *Tecniche di video intervista e inchiesta con la telecamera,* Logo Fausto Lupetti, Milano.

Cook D. A. (1995), *A history of narrative film*, Norton, London.

Cooper P., Dancyger K. (1994), *Come scrivere un cortometraggio*, Lindau, Torino.

Di Donato F. (2009), *La scienza e la rete*, University Press, Firenze.

Dibattista L. (2004), *Storia della scienza e didattica delle discipline scientifiche*,

Armando, Roma.

Donghi P. (2006), *Sui generis, Temi e riflessioni sulla comunicazione della scienza*, Laterza, Bari – Roma.

Eco U. (1983), *Sette anni di desiderio*, Bompiani, Milano.

Egri L. (2003), *L'arte della scrittura drammaturgica*, Audino, Roma.

Ejzenstejn S. (2000), *Lezioni di regia*, Einaudi, Torino.

Ejzenstejn S. (2003), *La forma cinematografica*, Einaudi, Torino.

Elsaesser T., Hagener M., (2009), *Teoria del film*, Einaudi, Torino.

Fabietti U., (2001), *Storia dell'antropologia*, Zannichelli, Milano.

Fabbro F. (2010), *Neuropsicologia dell'esperienza religiosa*, Astrolabio, Roma.

Flacone I., (1960). *Magia e nostalgia. La storia di un bambino che voleva fare il mago ed è diventato regista*, NSC anno VI n. 23, 7 settembre 2010.

Fellini F. (2006), *Fare un film*, Einaudi, Torino.

Field S. (1982), *Screenplay*, Dell, New York.

Gaudreault A. (2006), *Dal letterario al filmico*, Lindau, Torino.

Gauthier G. (2009), *Storia e pratiche del documentario*, Lindau, Torino,

Giannarelli A., Savorelli S., (2007), *Il film documentario*, Audino, Roma.

Giovannelli V. (2003), *Le tribù della televisione*, Mursia, Milano.

Govoni P. (2002), *Un pubblico per la scienza*, Carocci, Roma.

Grasso A. (2000), *La storia della televisione italiana*, Garzanti, Milano.

Grasso A. (1988), *Lo specchio sporco della televisione*, Fondazione Agnelli, Torino.

Grasso A. (1988), *Televisione*, Mondadori, Milano.

Haddon A. (1898), *The Study of Man*, New York : G.P. Putnam ; London : Bliss, Sands, & Co.

Haddon A. (1910), *Magic and Fetishism*, Adamant Media Corporation, London.

Haddon A. (1909), *The races of man and their distribution*, F.A. Stokes Co., New York.

Haddon A. (1979), History of anthropology, AMS Press, USA.

Haddon A. (1920), *Migrations of cultures in British New Guinea*, Royal Anthropological Institute, Great Britain and Ireland.

Jakobson R. (1993), *Saggi di linguistica generale*, Feltrinelli, Milano.

Khun T. (1999), *La struttura delle rivoluzioni scientifiche*, Einaudi, Torino.

Manzoli G. (2003), *Cinema e Letteratura*, Carocci, Roma.

Menduni E. (2002), *Televisione e società italiana*, Bompiani, Milano.

Menduni E. (2004), *La televisione*, Il Mulino, Bologna.

Menduni E. (2007), *I media digitali*, Laterza, Bri – Roma.

Menduni E., Catolfi A. (2009), *Produrre Tv*, Laterza, Bari – Roma.

Merzagora M. (2006), *Scienza da vedere*, Sironi, Milano.

Morales P. (2004), *Narrare con le immagini*, Audino, Roma.

Moscati M. (2000), *Breve storia del cinema*, Bompiani, Roma.

Parent-Altier D. (1998), *Introduzione alla sceneggiatura*, Lindau, Roma.

Pennacini C. (2005), *Filmare le culture*, Carocci, Roma.

Perniola I. (2003), *Chris Marker o del film-saggio*, Lindau, Torino.

Pinelli C. (2008), *La vita colta in flagrante*, Audino, Roma.

Robbiano G. (2000), *La sceneggiatura cinematografica*, Carocci, Roma.

Rondolino G. (2008), *Storia del cinema*, Utet, Torino.

Rondolino G. e D. Tomasi, (1995), *Manuale del film*, Utet, Torino.

Rossi P. (1997), *La nascita della scienza moderna in Europa*, Laterza, Roma-Bari.

Rutelli R. (2004), *Dal libro allo schermo*, ETS, Pisa.

Sartori G. (2007), *Homo videns Televisione e post-pensiero*, Laterza, Roma.

Seger L. (1994), *Come scrivere una grande sceneggiatura*, Audino, Roma.

Shinn, T., Whitley, Richard P. (1985), *Expository Science: Forms and Functions of Popularisation*, Elias, N. (et al.)

Shove, Elizabeth (2003), *Principals, agents, actors and research programmes*

Science and Public Policy, 30 (5).

Silverstone R. (1985), *Framing Science: The Making of a BBC Documentary*, British Film Inst, London.

Strunk W. (2008), *Elementi di stile nella scrittura*, Audino, Roma.

Taggi P. (2000*), Storie che guardano*, Editori riuniti, Roma.

Tarroni E. (1966), *Le tecniche audiovisive nell'insegnamento*, Armando, Roma.

Tessarolo T. (2007), *Net Tv. Come Internet cambierà la televisione per sempre*, Apogeo, Milano.

Tinazzi G. (2007), *La scrittura e lo sguardo*, Marsilio, Venezia.

Tomassini L. (2011), *Internet@Tv. Dalla televisione alla retevisione*, Franco Angeli, Roma.

Tosi V. (1984), *How to make a scentific audiovisual*, Unesco, Parigi.

Tosi V. (2007), *Il cinema prima del cinema*, Il Castoro, Milano.

Turney J. (2000), *Sulle trace di Frankenstein. Scienza, genetica e cultura popolare*, Einaudi,Torino.

Vanoye F. (1998), *La sceneggiatura. Forme dispositivi, modelli*, Lindau, Torino.

Montani P., (1975), *Vertov Dziga. L'occhio della rivoluzione*, scritti dal 1922 al 1924, Mazzotta, Milano.

Volpe S. (2008), *Adattamento*, Marsilio, Venezia.

Ziman John (2002), *La vera scienza. Natura e modelli operative della prassi scientifica*, Dedalo, Bari.

Webliography

http://www.altrocinema.it/archivio/archivi/alinamarazzi.htm

http://www.creativecommons.it

http://www.digitaleterrestre.it

http://www.gravita-zero.org

http://www.imdb.com

http://www.youtube.com/user/Raiscienze

http://www.youtube.com/user/NationalGeographic

http://www.youtube.com/user/gravitazero

http://www.marcodagostini.com

http://www.marconistudios.it

http://www.mymovies.com

http://www.sky.it

http://www.Ted.com