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A History of Technique in Film Music and Film Sound Post-Production in Italy.

Methodological Remarks Complementary to an Examination of Oral Memories[1]

Foreword

Often more prone to recognise the vitality and variety of silent film, historical research on film sound following the introduction of sound-on-disc and sound-on-film technologies in the second half of the 1920s starts, and most of the time finishes, with the analysis of technological standards and production processes spreading from North-American film industry. Apart from rare exceptions, in current literature Vitaphone, Movietone, RCA Photophone or other competing systems, or since the 1950s, the introduction of magnetic tape in sound post-production process, the Dolby era, even the more recent digital revolution, are shown like universal, neutral, a-historical means, media whose intrinsic characteristics are independent from the productive and cultural system they operate in. The introduction of new film sound formats, for instance, is often described in literature in a chronicling, almanac-like manner, which has little to do with the history of the real processes: regardless of motion-picture industry strategies, often the history of production processes and technological change has been reduced to, as Gomery puts it, «a tale of inventors as stars»[2]. Recent research has nevertheless shown that, for each period and nation, the cultural, artistic and technological picture is far richer and more complex. Also in the

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[1] The complete version of this study is: Ilario Meandri, *International Recording (1959-1969). Indagine sulle memorie orali. Working paper n. 1* (Torino, Kaplan, 2013, available online at the permanent url: http://www.suonoeimmagine.unito.it/internationalrecording/index.html).

[2] Douglas Gomery, *The Coming of Sound. A History*, New York and London, Routledge, 2005, p. XIII.

presence of codified standards and processes, the history of film music and film sound is, primarily, a matter of adaptation: different production systems propose multiform practices, original technical solutions with which sonic style and artistic conceptions are interwoven. Viewed from a North-American perspective, the swift and widespread adoption of a technical innovation worldwide appears as a global feature. However, a more attentive investigation reveals the same phenomenon to be glocal and multi-faceted, determined by the encounter with pre-existing practices that provide an original response to technological change, if not a resistance and, often, a *sui generis* assimilation.

Consistent efforts have been made in this sense in literature[3], with interdisciplinary works, which have started from the history of the industry, the producers and the practices, and made it possible to fill in significant historical voids. However, knowledge of the industrial processes of sound post-production still lacks methodical contributions on the Italian case, except for few studies.

The research I shall here refer to has developed within *Cabiria* Project, first coordinated by Luisa Zanoncelli, then by Annarita Colturato. Like many times before, I owe the fundamental incentive which has driven this study to Luisa Zanoncelli. In its initial stages, the idea was to consider musicological, aesthetic, bibliographical approaches along with an ethnomusicological perspective for the study of film music. The first definition of this research was in February 2012. It intended to clarify which theoretical tools this contribution could be based on[4] within the methodological framework of media anthropology. Thus, in a survey on oral memories aimed at studying post-production practices, technological change and technological adaptation, we identified one of the possible fields of interdisciplinary collaboration.

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[3] See, in a not comprehensive list, the following contributions: *Sound Theory/Sound Practice*, edited by Rick Altman, Routledge, New York and London, 1992; *Sound-On-Film: Interviews with Creators of Film Sound*, edited by Vincent LoBrutto, Westport and London, Praeger, 1994; Rick Altman, *Silent Film Sound*, New York, Columbia University Press, 2004; D. Gomery, *The Coming of Sound*; Martin Barnier, *Bruits, cris, musiques de films. Les projections avant 1914*, Rennes, Presses Universitaires de Rennes, 2010; Mark Kerins, *Beyond Dolby (Stereo). Cinema in the Digital Sound Age*, Bloomington and Indianapolis, Indiana University Press, 2011.

[4] Also through a comparison of the methodological approaches of media anthropology, a branch of studies that has developed especially in the past ten years. For further examination see Febo Guizzi and Ilario Meandri, *Il paesaggio sonoro del carnevale di Ivrea e le sue musiche. Mediazione, immediatezza, rimediazione*, in *L'etnomusicologia italiana a sessanta anni dalla nascita del CNSMP*, edited by Francesco Giannattasio and Giorgio Adamo, Roma, Accademia Nazionale di Santa Cecilia, 2014.

Although this work was initially a theoretical-methodological study, it took a decisive turn in July of the same year, when it was transformed into a field research to be carried out in Rome, the city hosting the main sound post-production facilities in Italy. The premises of this new research were the following: 1) from a methodological point of view, the historical reconstruction of production processes is complementary to a correct philological outlook, since it requires a more conscious questioning of the technical layers creating the soundtrack; 2) an examination of the interwoven relations between the process of composition, the score and the recording media on one hand (the composer's atelier), and of the relationship between the composers and craftsmen taking part in the process on the other (which is essential in order to acquire a better understanding of this art form and of its sources specificity). The goal was, therefore, to outline the technical evolution of the sound and music post-production cycle, even if limited to a few years, through a survey on oral memories.

Initial Mediation Network and Field Research Specificities

In previous studies I had conducted an ethnomusicological research on foley artists and sound craftsmen in Italian cinema, tracing, also from the technical point of view, the history of sound practices from the 1950s to the present day[5]. It was but a small portion of the sound post-production process, which today takes place outside sound post-production facilities[6], with the latter usually sealed off from non-works personnel. I knew that extending the research to the whole process would have entailed a few difficulties, since many more thorny questions had to be taken into consideration. Nonetheless, my previous research offered a starting point to begin this examination. Alongside the relationship with fellow foley artists (Italo Cameracanna, Paolo Amici, Daniele Quadroli, Massimo and Marco Marinelli, Enzo Diliberto), there was an important bond with Federico Savina, film sound guru at the Centro Sperimentale di Cinematografia, former Dolby

[5] See Ilario Meandri, *Il suono immaginato*, «La valle dell'Eden», XII-XIII, 25-26, 2010-2011, pp. 170-211.
[6] Although many sound editors and foley artists work renting spaces at post-production facilities such as Arcangeli group at Fonoroma and Studio 16 Sound group at Technicolor. Moreover, we shall distinguish between free-access and off-limits areas in these facilities. For security reasons the facilities are designed "as an onion" with gradually restricted areas monitored with sophisticated anti-piracy services. Departments where dubbing of major international movies is in progress are considered a "red zone" and it is extremely difficult to obtain free access to them.

consultant and film music scoring mixer, whose contribution was pivotal to this research. Various meetings took place with the operators in intensive preliminary field work which lasted from 15th September to 30th October 2012, and in a series of shorter surveys of approximately a week, carried out in February, March, May and June 2013. Whenever possible, research has always taken the form of participant observation. When not, or only partially[7], there were many meetings, before actually getting to the heart of the matter. Only seldom have the first meetings been recorded. During subsequent meetings I gathered recordings with: Massimo Anzellotti (foley artist), Luciano Anzellotti (foley artist), Luca Anzellotti (ambient sounds and special sound effects editor[8]), Paolo Amici (special sound effects editor), Roberto Arcangeli (foley artist), Livio Argentini (hardware manufacturer), Sergio Basili (foley artist), Gianluca Basili (ambient sounds and special sound effect editor), Paolo Biondo (entrepreneur, former general director of International Recording), Marcello Braca (collector and expert on history of audio technology), Italo Cameracanna (foley artist), Francesco Cucinelli (dubbing mixer), Cristiano Ciccone (dubbing mixer assistant, videogame sound mixer), Antonio Croce (audio engineer), Enzo Diliberto (foley artist), Luigi Di Fiore (sound engineer and DTS consultant), Mario Lupi (audio engineer and hardware manufacturer), Massimo Marinelli (ambient sounds and special sound effects editor), Marco Marinelli (ambient sounds editor), Danilo Moroni (dubbing mixer), Fabrizio Nisi (Technicolor manager and former audio engineer), Tonino Grande (audio engineer), Gianni Pallotto (dubbing mixer), Daniele Quadroli (ambient sounds and special sound effect editor), Massimo Rocchi (ambient sounds and special sound effect editor), Federico Savina (CSC teacher and former music scoring mixer and Dolby consultant), Alberto Sbroscia (audio engineer, former technical director of International Recording), Marco Streccioni (music scoring mixer), Domenico Soldati (audio engineer), Marco Stefani (hardware and software designer and Dolby consultant), Francesco Tumminello (dubbing mixer), Daniele Turchetta (Technicolor operation manager and former sound engineer), Fabio Venturi (film scoring mixer), Maurizio Volpato (Gervasi Elettronica, hardware designer and manufacturer). During the interviews the following factories and studios were inspected: Technicolor (Roma, via Urbana's branch), Marinelli Effetti Sonori, Anzellotti

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[7] See previous footnote.

[8] I shall hereby use some terms proper to the Italian practice, which distinguishes between operators dubbing *rumori ambienti* (ambient sounds), *effetti sonori speciali* (special sound effects), and *rumori sala* (foley stage sounds).

Sound Effects, CDC SEFIT Group, Fonoroma Film Recording, Studio 16 Sound, New Digital, Gruppo Arcangeli, Gervasi Elettronica, Togra Audiopro. Part of the research was conducted on Lavagnino Collection, on Savina Collection and on Appierto Collection at the Biblioteca "Luigi Chiarini" del Centro Sperimentale di Cinematografia.

At these studios and factories I took pictures of documents, equipment and their structural details, taken with a Pentax Kr Reflex digital camera. In the participant observation stage, I shot several hours of films of audio-visual recording, shot with digital camcorder Canon MD111. I have gathered audio recordings for a total exceeding 65 hours, taken with Zoom H1 digital recorder, and with Tascam HD-P2 recorder and Shure microphones (used for high-quality sound recording documenting foley sound instruments and techniques). With the collaboration of the technicians from Marinelli Effetti Sonori, I have proceeded with the acquisition of several effects contained on ¼-inch tapes dating 1960s, on Studer tape recorder, properly calibrated and equalised, digitalised with AD[9] Pro Tools converters; with the collaboration of Studio 16 Sound engineers of some effects contained on $^1/_8$-inch tapes dating back to 1967-68, digitalised with AD Pro Tools converters. I have thus proceeded with a full transcription of the interviews[10]; in this task, between November 2012 and January 2013, I had the benefit of the invaluable collaboration of Sonia Antoniazzi, Daniele Paradiso and Viviana Goggi, to whom I am very grateful[11]. When comparing these data the source is, obviously, not the textual transcription, which is of little documentary relevance, but the original recording: the transcription has acted as a sort of compass making me identify and organise the subjects in view of the vast quantity of material. However, once the relevant sections are identified, I have always gone back to the recording to draw the due conclusions, since a small voice inflection, a reticence, are more telling than their transcription. The latter takes the sense of statements to the extreme, and at the same time dilutes or alters highly informative details that are useful for interpretation. I have then proceeded

[9] Analogue to Digital converters.
[10] The interviews with Paolo Biondo, Danilo Moroni, Federico Savina, Alberto Sbroscia, Domenico Soldati were fully transcribed – along with the most relevant parts of the remaining interviews – for a total of approximately 900 standard typewritten pages.
[11] I am well aware of one of the primary deontological principles of ethnomusicology, which prescribes the continuity between collection and transcription-analysis of materials. However, due to the lack of time, I have not personally transcribed this part of the interviews, though I have always gone back to check and re-listen to the original recording every time a fragment was used in this study.

to prepare a series of halfway reports, listed by subject, following the logic by which the information is presented in the interviews.

The first obstacle to overcome is that for many, among the people involved, our goal – tracing the cycles of technological change – is not only impossible, but also pointless (this is not an unprecedented case in cultural anthropology[12]). Moreover, the interference of an external and not "in the trade" interlocutor can be perceived as an improper intrusion. For the researcher, this entails a great deal of sensitivity and care, profession of humility, intense study to show an understanding of the subject, besides the initial mediation of a reliable relational network. Without this awareness the contact with field professionals risks being unproductive or superficial, often ending up as an interview without an actual dialogue, where the most important information is frequently omitted. From previous field experiences I knew there were two major risks (dangers common to almost all neighbouring research fields). The first, and the most resistant danger is to establish an "interviewer"-"interviewee" relationship – the interview framing – which builds up incompatible expectations for an inquiry on oral memories. In most instances I have tried to avoid this by carefully choosing the mediators introducing me to the context. The second danger is the risk of pinning down the subjects and times of the examination with specific questions, which would have led to nothing but silence or, at least, reticence. I believe only one course is possible: i.e. to support flowing conversation and free associations as if they were the grain of wooden surface slowly coming to light. In time, the profile of technological change has become increasingly clear; correspondences started making sense, contradictions were productive and likewise information proved to be unfounded[13].

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[12] This occurs almost every time the ethnomusicologist has to deal with musical professionalism. His work inevitably involves a deconstruction of the ways memories are created, together with the mythopoeia they are part of. This deconstruction work has sometimes met with great favour; at other times with understandable reticence, according to the assumption, several times raised, that one cannot «mettere ordine» (tidy up) memories, «come non si può mettere ordine nel caos della vita» (just as you cannot tidy up the chaos of life), as a speaker once said to me.

[13] We ought to ponder on what is stated in note 12. The mythopoeia memories are part of a collective construction. For example, for the foleys, Leone and *C'era una volta il West* (1968) are pieces of a shared *identity* foundation, dating back to a time when the Roman foley school gained an independent productive capacity and distinct stylistic recognisability. Therefore, it is perfectly normal that many foley artists want to identify with Leone's work, although historical fact may deny the many and warmly asserted participations. But we must fully understand what information this news conveys: if we seek in it a confirmation of the historical fact, we fail to interpret it for what it really tells us. As Jan Vansina has authoritatively claimed, the piece

Another difficulty influences the relationship with the people involved. The world of professions has usually maintained close contacts with universities and criticism. Both, for a number of (more or less understandable) reasons, are often regarded with suspicion and scepticism. Academic culture is generally perceived as elitist and distant; its goals abstract and unintelligible. As the semiological-textualist approach has dominated film studies (at least in Italy), historiography has often been a history of texts, unaware (or uninterested) in the processes and craftsmen who built them. Relations with the humanities, which had the chance to be more promising are thus actually burdened with the ambivalences of a humanism in the doldrums, which, unclear to itself, proves to be incapable of *humanitas*[14]. The uncertainty of oral sources, with their endemic inclination toward contradiction, have often determined their being excluded from the group of reliable or certain sources (at least for historical periods they can help shed light on). This is also because they report on events that happened on the border of historiographically well-known processes, or which convey a sense of such vitality and complexity that they shatter the apparent unity of

of information, even if not based on fact, is decisive for understanding the relational network through which that information spreads, which is highly informative from the ethnographic point of view. In our specific case, if purposefully questioned, the same information sheds light on the «working constitution» power structure and on the relational networks the system is based on. Often the contradictions are not memory *mistakes*, where one or the other version is true, but the indicator of a different narrative of the same events, which, if purposefully questioned, reveals different perspectives, for instance the result of the work in different facilities or of the competition between them, nuances which are fundamental to historical reconstruction. For a methodological introduction to oral sources interrogation see Jan Vansina, *Oral Tradition as History*, Madison, University of Wisconsin Press, 1985.

[14] Such as the approaches which look at the speaker as an *informer* who has to provide *data* whose elaboration is an exclusive prerogative of scientific culture. This is not the idea of *relationship* in an anthropological perspective, which rather than thinking of the field as the allotted place for a truistic demonstration of a specific theory, conceives it as the place of shared formulation of *new* theories, where the researcher's starting assumptions must be renegotiated. The first approach – the operator as *informer* – exposes the weakness of *humanitas*. This concept informs the desire and the utopias of modern cultural anthropology, according to the famous Terentian motto *homo sum: humani a me nihil alienum puto*. In the concreteness of our case this means that no stage, detail, idea referred by the interlocutors can arbitrarily be ruled out following a project which has the absolute priority. Moreover, what is written should be conceived as interacting *with* the speakers, even though not *for* them (since independence is always desirable). According to the ethical tenets of anthropological-cultural disciplines writing is indeed *part of mediation and contact*, also in consideration of giving once more sense to collected testimonies and following the priority order that has arisen from the renegotiation following the experience on field. This is already, from the anthropological-musical point of view, highly informative on the sensitiveness of a «working constitution» and of its imaginary.

events. Rick Altman has already authoritatively written on the ways with which the historical and scientific canon has in the past wiped out entire phenomena of great cultural importance, and on the relation between this exclusion and the inability to turn to alternative sources. A good example is the publication bias which has shaped our perception of silent film sound on the model of 1920s «picture palace music» (and this because of the better accessibility of its sources – cue sheets, arrangements, scores). That research should concentrate on where the sources are more thriving is certainly understandable. The problem is the projection of inferences deriving from the analysis of this phenomenon to the multifaceted world of silent film sound. As Altman writes:

> New […] reconstructions have both shown a marked preference for the culturally acceptable "great" films of the Twenties. All these practices overemphasize special orchestral music played in picture palaces of large eastern cities. Even for the Twenties, this approach skews our understanding of film music; entirely absent are the other parts of the program (newsreel, scenic, organ solo), the other parts of the country (where ragtime, ethnic traditions, and popular songs often endured), and the other parts of town (where an African American ensemble might be improvising)[15].

This warning has been largely rewarded with a distinct trend inversion as studies recovering whole neglected portions of music worlds in silent film have been spreading in the last few years, at least in the U.S. (think of research on cultural areas where music forms and modes of participation in the new entertainment of movies were guaranteed by oral and community traditions, such as the sing-along practices in many storefront theatres during the aughts).

Relating the above to our specific topic, the relationship with the craftsmen does not happen in a vacuum, using Feld's words[16]. Like much field research, far and near, everything happens in a network full of "precedents" to be taken into account, including the conscious exclusion of the everyday knowledge of film workers from the group of historiography sources. Hence, when the attitude is not indifference (which can be an advantage for research) in the vast majority of cases one is confronted with a widespread

[15] R. Altman, *Silent Film Sound*, p. 10.
[16] Cf. Steven Feld, *Sound and Sentiment, Birds, Weeping, Poetics, and Song in Kaluli Expression*, Philadelphia, University of Pennsylvania Press, 1982 (2nd ed. consulted, 1990, p. 10).

resentment toward academic culture. Recognising and bringing to light this point is essential to guide the contact toward a mutual relationship of trust, which must be constantly fuelled. When this obstacle is overcome, from the very first meetings the discovery of the depths of oral memory is a miracle which takes place before the eyes of the researcher and his interlocutor. This experience triggers the relationship, but it is met with understandable reticence and ambivalence: it is an access to profound states of memory and life, of its disappointed or foreseen expectations, anyhow entailing a considerable emotional effort, which increasingly informs the interviews, with jolly tones growing from the pleasure of a discovery, or sometimes melancholic, at times determined by the memory of unpleasant relationships or difficult professional moments. Little can be surmised of the speaker's emotional state when these sentences are uttered:

> È una bella giornata oggi… […] è la luce, la luce… la luce è molto importante nelle cose che le racconto, sa?
> (Paolo Biondo, personal communication during the interviews, 27 March 2013, Rome).

> Le notti dopo le *interviste*, sai… non sono mica facili.
> (*omissis*, 30 October 2012, Rome [emphasis added]).

> Sentivo sempre quando arrivava la pioggia, dal ronzio che facevano gli amplificatori prima che piovesse, non so se per quella falda sotterranea[17] che ti ho detto… (lunga pausa) non era un periodo facile […].
> (*omissis*, 30 October 2012, Rome).

Another witness reports his first experience as a stuntman in Cinecittà, during his adolescence. Customarily – because of the poor conditions of the Roman suburbs in the post war years – sometimes damage and injuries were self-inflicted to claim compensation from the production insurance. This is a moment the person who told it remembers with irony and bitterness:

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[17] The speaker refers to a water table located under the International Recording facility, which, according to his hypothesis, influenced the effectiveness of the general grounding system of the facility making the spikes audible. The disturbances were likely to be caused not really by a problem in the ground of the factory, but rather by the fact that, under certain circumstances, the water table put the International Recording soil into contact with adjacent soils of factories and/or buildings the disturbances came from.

> Stavamo su un aereo, si apre una botola e cadiamo di sotto. […]
> Famo sta caduta, benissimo. Famone 'n'altra… cadevamo da 'st'al-
> tezza qui, c'erano i materassi sotto. Eravamo in quattro. […] e mi
> ricordo la seconda caduta che facciamo 'st'amico mio me fa: «'n
> te sei fatto niente». Ho fatto «no». «Come no! fa vede il labbro»; e
> prende il labbro… con la carta vetrata… «sbrac!» (mima il gesto di
> strappare un labbro)… insomma… banditi! […].
> (*omissis*, 18 October 2012, Rome).

The emotion and vividness of this memory affect the prosody:

> Pasolini stesso ci indicò il posto dove andare a registrare il silenzio
> e le arie che voleva per il suo film. Disse a Renato: «Se vai sull'Ap-
> pia Antica, lì troverai il silenzio vero, il silenzio che mi interessa».
> […] E con Renato andammo: ed era una campagna aperta, silen-
> ziosissima, senza alberi, molto brulla, un suono molto particolare,
> un ambiente aperto, ma molto silenzioso, lontano dalla città, non
> c'erano uccellini perché non c'erano alberi, era tutto prato, e allora
> sentivi questo silenzio sonoro, vivo[18].

In view of these issues, appropriate breaks were left between meetings, as it was necessary to let memories resurface which had long lain dormant, and leave the cogs turning to bring back new recollections. Thus, I had always tried to find a balance over the frequency of meetings, even when it meant slowing the research down, keeping in check the researcher's cognitive anxieties when they were inappropriate. *Imponderabilia* of real life[19], as such emerging in these fragments, are to the ethnomusicologist one of the most engaging results in research, as they bring back biographical details on the relationship between men[20] and the long gone soundscapes of Italy and Rome during the late Fifties and the early Sixties; these memories are always acute in human beings who have devoted their lives to sound. From an ethnomusicological perspective, but also according to the anthropologi-

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[18] This passage is taken from an interview with Italo Cameracanna, published in I. Meandri, *Il suono immaginato*, p. 197.

[19] I use here Malinowski's well known words. See Bronislaw Malinowski, *Argonauts of the Western Pacific. An Account of Native Enterprise and Adventure in the Archipelagoes of Melanesian New Guinea*, London, Routledge & Kegan Paul, 1922.

[20] The term is not used here in an unconsciously universalist manner: the presence of women is extremely rare, since this is an almost entirely male-oriented job.

cal historiography[21], all of this seems just as important and inseparable from the "data" on technological change inferable from the interviews: they are part of one whole issue.

The initial strategy – which I mention here since it contains a methodological premise I believe to be essential – was to wager on the "king" of the post-production process: the dubbing mixer. Here I hoped to find the mediation necessary to introduce me to the chain of professional relations inside a facility, thus enabling me to reconstruct the cycles of technological change for the many jobs involved in the creation of a soundtrack. The interviews with the dubbing mixers, besides showing details on mixing technique, tended, indeed to revolve around the relational nodes inside the post-production process – for example reflecting on relationships, whether technical or artistic, between dubbing mixer and music scoring mixer, ADR dialogue editors, Dolby consultants, musicians, special sound effects editors, foley artists, music editors[22], directors, boom operators and so on. In this approach I relived most of the problems uncovered when, as a "strategic" starting point for a previous work on Hollywood composers, I had chosen to start from the music editor. As he is the "aleph" of all the tensions marking the composition process I had been able to sketch an overview of it[23]. The same applies to the dubbing mixer: one of his essential qualities, in keeping with the technical nature of the job, is the coordination and daily mediation with the different professionals of a sound post-production facility. As it clearly emerged from the field work, this networking ability structures the memory of events and, consequently, the retrospective awareness of technological change[24]: the rec-

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[21] See Carlo Ginzburg, *Spie. Radici di un paradigma indiziario*, in *Miti, emblemi, spie. Morfologia e storia*, Torino, Einaudi, 1986, pp. 158-209.

[22] In Italian the *montatore musiche* describes a very different job from the music editor in American practice. We decided to translate the operators' role with similar terms taken from the American practice. However, we must point out that in the Italian practice to the same roles different jobs might be assigned.

[23] Cf. Ilario Meandri, *La fabbrica dei sogni. Un'introduzione etnomusicologica al mainstream musicale hollywoodiano*, Torino, Kaplan, 2013.

[24] It is essential to turn to the dubbing mixer to study the technological competition between music (hereby meant as the world of music recording) and cinema (here meant as the world of film sound). Music used to be the record holder of technological innovation – the music world driving sound technology until the late 1970s – while cinema was related to a rather old technology (i.e. optical recording, which has its limitations even when part of the post-production process was converted to magnetic sound in the late 1950s). This relationship gradually inverted its course when Dolby was introduced: since the 1980s film dubbing mixers indeed found music scoring mixers habits obsolete. This interaction still fuels confrontation between the different productive worlds of music and cinema.

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ollection of past processes and techniques is indeed organised in a very different way according to the crafts. An example may be useful here. Between a mixing console in the 1970s and a Neve 8040 console, even though these technologies are not comparable, there is no gap from the point of view of ergonomic functionality. Even with the skeumorphism of digital interfaces[25], the manufacturing companies and their representing mediators still have to wager precisely on functional coherency to guarantee the success of a product. Above everything else, a new device has to guarantee coherence with the existing practices. The motions of the sound mixing technician are thus basically the same, year in year out. Of course the Dolby age, and later the digital revolution, has impacted the aural coordinates of this world introducing macroscopic changes (think of multichannel audio), as well as small procedural details introduced by the use of digital interfaces (such as the asymmetry of the dubbing mixer position in connection with the DAW screen[26], or the introduction of interfaces which represent audio tracks on screen, thus leading to a different conceptualisation of the aural information[27]). But the perspective from which the sound mixing technician absorbs the change is still linked to that combination of usual motions, repeated every day hundreds of times on the console. These gestures do not change over the years, and rarely experience cultural shocks comparable, for instance, to the introduction of fader consoles or to automation. Indeed the latter was a shock whose importance has been underlined in literature but, according to what the technicians themselves say, it might not be quite so important[28].

[25] *Skeumorph*: «an object or feature which imitates the design of a similar artifact in another material». In the project of graphic interfaces for information technology skeumorph is «an element of a graphical user interface which mimics a physical object» (*Oxford Dictionaries*, http://oxforddictionaries.com/, last retrieved: September 2013).
[26] DAW is the acronym which stands for Digital Audio Workstation. The control displays, say, of a Pro Tools or of a Pyramix workstation are usually placed on the right or left of the mixing console. The sound engineer is therefore forced to rotate his head to have access to visual information, thus breaking the frontal interaction design between human and machine, contrary to previous ergonomics dating back to the design of the first mixing consoles which was perfected during the 1940s.
[27] See on this point the work by Alan Williams, *Putting It on Display: The Impact of Visual Information On Control Room Dynamics*, «Journal on the Art of Record Production», 6, 2012 (available online at the address: http://arpjournal.com/1845/putting-it-on-display-the-impact-of-visual-information-on-control-room-dynamics/, last retrieved September 2013). I wish to thank Carlo Nardi for having pointed out Alan Williams' works to me.
[28] Savina (6 October 2013, Rome). Hereafter we shall refer to the oral sources with an existing recording, indicating name and date of the personal communication in order to univocally identify the recording session where the information is provided. For a full list of

Metaphorically speaking, the dubbing mixer presides over a flow in a continuously running river: technological change slips "through his fingers", without changing his gestural habits[29].

The contact with maintenance technicians and with technical directors – the craftsmen who sustain the dubbing mixer and manage the complex machine of a facility – was the cornerstone of this research. Francesco Cucinelli, Technicolor dubbing mixer, was the first to suggest this approach during an early interview. As we shall see, in this case another kind of logic organises the memory of technological change. Having to deal with the dozens of problems arising during the everyday process, dismantling and reassembling circuits, keeping diaries and notes of the installations, building new machines, all means accessing a repository of information of unique value, often the object of a veritable photographic memory. For instance Alberto Sbroscia, former technical director of International Recording (from now on IR), immediately recalls the 12AX7 and 12AU7 electron valves, which together with the 12AT7 and 6X4 valves make up Ampex 351 electronics. On the other hand, Federico Savina was music scoring mixer in the early Sixties. In considering the difficulties of a reliable attribution on Ampex models he provides procedural details on recording operations. Contrary to Sbroscia's memories, Savina's recollections are structured around the usual movements on the device controls: a kinetic-procedural memory, rather than a visual-photographic one, in this case guides the instrument identification[30].

The more the researcher delves into this topic, the more he discovers that the difficulty lies in choosing the level of depth where the analysis has to stop. Like all apparently obvious notions, the concept of "technique"

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the recordings and for any details on their preservation and on the ways to access to them see I. Meandri, *International Recording*.

[29] In a metaphor – except for music scoring mixers or dubbing engineers with a strong technical vocation like Federico Savina who also designed systems – the mixer looks at the apple from the outside. One should assume that he knows what the apple is, just as the caterpillar does.

[30] This is a feature in common with dubbing mixers. For example, during a meeting with Federico Savina and Fausto Ancillai, in recalling the details of a film reel, Ancillai mimicked the movements of the console faders on the sequence (an audio-tactile detail guides the gradual resurfacing of a memory). Also years later, for particularly important works tried time and again, it is not unusual for many movement sequences to remain vivid in the dubbing mixer memory. Before the introduction of automation the dubbing mixer peculiarities lay in the ability to memorise the fader movements and exactly reproduce them at each passage. This detail is pivotal from the methodological standpoint: dialoguing with the sound technician may potentially benefit from contact tools designed so as to recognise and promote this quality.

is quite ambivalent; and the first days of field research have shown the vagueness of this notion, its volatility. Its illusory pragmatism, even within a facility, identifies very different worlds. "Technique" means a group of control surfaces and processes for a dubbing mixer; it defines the electronic assembly of a device for a technical director; it identifies mechanical engineering problems for a tape transport constructor; and more and more infinitesimal electronic engineering details for a circuit builder, for a light-valve[31] repairer, for a sound head manufacturer, for an consultant on sensitometry that deals with the chemical behaviour of film negative for optical sound recording. "Technique" is a mobile horizon, which changes as jobs do. When dealing with technological change in film sound, deciding where to stop cannot be easily predetermined on a theoretical basis. Favoring an empirical approach, I have chosen to stop where the sound practices started to fade, in other words, when an excess of detail did not add determining data for their better understanding. In order to do all this, one needs to venture into an almost unknown territory, each time assessing its boundaries. During the reconstruction many technicians have cautioned me on its difficulties (if not, as I mentioned, on its impossibility) with arguments which need to be carefully assessed. The first difficulty is telling: if it is possible to determine with good approximation how an instrument enters a facility, it is very hard to imagine how, a few years later, the same instrument exits the same studio. Just as a new device starts working, the introduction of new features are the norm, alongside continuous improvements by the technical department. Replacing the internal components is customary and, as Sbroscia[32] reports, sometimes new changes to the circuits are produced on the spot, without even going through schemes. Often they can turn out to be a surprise to their own makers, who several times happened to resort to reverse engineering in order to figure out the logic behind the weird changes made years before. Even when the projects existed, they have gone missing together with the devices, disposed of once they became obsolete. Moreover, the equipment is constantly moved when optimising the different departments of a studio, if not between different facilities. Each photograph claiming to freeze this flow reproduces but an abstract version of little historical and documentary pertinence. Secondly, a sound post-production facility is not a music recording studio, nor a sound effects studio, such as examples where machines are limited

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[31] A *light-valve* is an essential component of Westrex optical records.
[32] Sbroscia (27 September 2012, Rome).

to little equipment and few operating subjects. A post-production factory is, conversely, an outrageously complex structure, with extremely long life cycles (for instance, from over fifty years of International Recording/ Technicolor, to over eighty years of Fonoroma). We therefore face an accumulation of devices, changes, machines that keep the same names with rather different functions, and different operating subjects. On one hand there are the "customers", i.e. the productions, each with different habits; on the other hand sound engineers and operators belonging to different generations, thus determining syncretic procedures, even in the same facility. In order to be adequately rendered, these practices must be assessed case by case, facility by facility. All together this determines a combinatorial explosion, inherent to all the "states" which one has to take into account for a careful historical analysis. This is an obstacle which seems hard to overcome in the eyes of those who worked there (even though we are dealing with engineers or entrepreneurs with a remarkable memory). I have consciously tried forcing this limit. I also did this to test how far one could venture within the allotted time of this research, thus taking from this first journey a concrete indication of the complexity of the field, and of the resources that research has to provide to render a more accurate history of film sound in Italy (such a venture, among its merits, would at least tell us how much of this story is unknown).

The choice of reorganising the materials gathered stemmed from this awareness, following correspondences, sources and documents converging on one case – the IR one, which is among the most important film sound facilities in Italy.

Results Achieved

The results achieved are definitely encouraging. The historical facts referred to are confirmed by different sources: oral memories allow one to accurately trace back the whole process and the main nodes of technological change, at least from the mid 1940s to today. During the research I have been able to benefit from a lasting and fruitful contact with Paolo Biondo, an American citizen, former CEO at IR from 1980 to 2004, when the facility was acquired by Technicolor. Paolo Biondo, an extraordinary personality, guided the facility through several technological revolutions until the mid 2000s. From his father – engineer Giuseppe Antonino Biondo, founder of IR and Italian RCA and leading figure in the American RCA – he received detailed accounts on the technological and commercial development of RCA activi-

ties at the Paris and New York offices (where his father had worked) dating back to the mid 1920s. I have gathered information on the cultural and political Roman background in the second post war period, when Giuseppe Biondo based his business in Italy. Biondo has also agreed to open his private archive to consultation, whose documents, interpreted by oral memories (and vice versa), shed light on Giuseppe Biondo's American years and on the context of strong technological struggle between major American competitors in Europe and Italy (namely, General Electric, Westinghouse, RCA) in the wake of World War II.

At the end of 1957, once Giuseppe Biondo had finished his experience as head of via Tiburtina's RCA Italiana,[33] he established a new film sound post-production facility, International Recording, whose articles of association were drawn up in 1957.

As mentioned above, the former facility technical directors and maintenance technicians were the key-informers of this research, as well as dubbing mixers, music scoring mixers and re-recording engineers' assistants – the latter among the representatives of the future generation of engineers now in apprenticeship. At the same time, contacts were made and in-depth interviews were conducted with designers and manufacturers of sound post-production equipment. The lineage of long-gone main engineers, hardware designers and manufacturers has been traced back from the post war years to today. In parallel, the network connecting several Italian facilities in close creative collaboration with manufacturers has been outlined, in order to clearly understand which devices would be customised, according to which specifics and functions. The main turning points marking technological change in Rome sound post-production studios have been sketched: from

[33] Besides printing American masters, the first music production includes the recording of «musica leggera» and «classica, sinfonica, operistica» music, as the first catalogue dating December 1953 reads. In it the company is called RTI – Radio e Televisione Italiana (though not for long) according to the business name which was used for a short time before RCA Italiana. Since RCA did not posses autonomous recording stages until the beginning of the 1960s, music was recorded in rented studios. The first agreement was with the Vatican where, for instance, the first RTI production with Modugno and Armando Trovajoli's Eclipse orchestra was recorded. Soon afterwards, Vittorio Trentino – with Paolo Ketoff and Ubaldo Consoli among the music scoring mixers who were then working for RCA – negotiated a lease contract for the Cinecittà recording stage with engineer Rinaldi, Cinefonico technical director. Soon afterwards the relations with Cinefonico came to an end since RCA rented a new office in viale Pola. This office, built during Fascism and with good acoustic performance, was reequipped with new systems, such as two 7½ and 15 ips RCA recorders and a console for music-mixing. Almost half of the recording activities of RCA were for film music, at this time one of the most rewarding businesses.

field work I have empirically derived elements for a detailed periodisation (thus, this chronology does not rely on American literature, which would be of little relevance for understanding Italian peculiarities). The meetings with Paolo Biondo, Federico Savina, Alberto Sbroscia and Domenico Soldati have been fundamental to a specific analysis of the events taking place within IR. These sources have been compared to the technical notes by Bernard Shelley, former technical director of Decca in England and then technical director of IR. Shelley was among the undisputed protagonists of the innovation of Italian film sound until the 1980s and, in particular, the pivotal figure of the five years' transition to Dolby SVA[34]. In the documents Domenico Soldati has kept at Technicolor archives[35], Shelley took a series of notes on equipment in the 1960s and 70s. In an incomplete list, there are tests on sound heads and mikes, tapes and heads frequency response, on the types of tapes used, on the design of experimental filters, new machines and circuits, on changes to the bias frequency of the records, on the design of new oscillating circuits, and on the gradual transformation of microphones. This valuable series of notes cannot however have priority over oral sources. The notes are, indeed, sometimes the result of impromptu tests, momentary determinations in a flow of events, which cannot always be referred to the facility equipment. The two types of source must therefore be compared and, in most cases, oral sources are crucial for the correct contextualisation of technical notes. Moreover, I have gathered detailed information, divided by period, on the hardware calibration and ordinary maintenance procedures, and on the tapes used according to the different machines and/or post-production stages.

Furthermore, collections of high historical and documentary value have been discovered, up to now unknown outside the technical-productive world. Among these are collections with sound material from foley artists companies established since the mid 1960s: around 1,000 sound objects, dat-

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[34] Dolby SVA, i.e. Dolby Stereo Variable Area (or Stereo Dolby), or Analogue Dolby.

[35] In particular, the technical notes by Bernard Shelley are pivotal (hereinafter *Quaderno tecnico*). This document is held at the private archives at Technicolor technical department alongside other loose sheets and folders containing projects by Shelley. The *Quaderno tecnico* is a 150x203mm notebook, with squared sheets and a cover signed with a felt-tip pen by Shelley. The document contains technical notes written in pen or pencil, nearly always dated, on progressive sheets and with uniform handwriting, except for some rare pasted sheets, a missing sheet and some notes signed F.S. (Federico Savina). The first date, written on f. [5r], is 29 November 1962. The last date, written on f. [49v], goes back to 20 October 1976. The notes drafted between 1964 and 1974 are more similar and uniform. Some jumbled notes written on sheets very close to the ones in the *Quaderno tecnico* bear dates following this period.

ing 1950s-1970s; ½ inch magnetic tapes (produced with Mahiak, Stellavox, Nagra, Butoba, Uher recorders) for a total of approximately 10,000 magnetic tapes containing special sound effects and ambient sounds. The conservative estimate of the archives of one company amounts to circa 4,600 ¼" tapes, containing an average of twelve effects per tape, for a total of about 55,000 effects. Archives of sound material recorded on $^1/_8$-inch tape have also been discovered. These compact cassette tapes are the result of transcriptions from previous archives and were used in the so-called basette practice (a special device built in the mid sixties to generate ambient sounds on the go while mixing). It is a heritage of great historical and documentary value, unique in Italy and, to my knowledge, in Europe. Finally, selected works (sketches and timing notes) by composers Angelo Francesco Lavagnino and Carlo Savina have been analysed, cross-checking the documents with the information gathered by oral sources. This has allowed us to shed light on music recording and synchronisation practices and on the relation between sketches, scores and recording technique, pertaining to the work carried out at IR.

In the first stage of field data elaboration I have prioritised a technical account of IR, from its establishment to around 1969, when multi-track recording was introduced and when substantial innovations had already been brought into use in post-production[36]. All this is intended to reduce to a set of possibilities, however various, what can and cannot be done with these instruments, in a specific historical period and in a given facility. From this perspective the understanding of current practices may appear subject to an analysis of technological standards. Unfortunately only a short-sighted determinism could argue that technology prevails over practices. The research offers several empirical arguments about this question. Let us consider the introduction of the so-called basette[37] for the production of ambient effects. This is an example where small variations at the border of a standard practice cause long-term consequences on technique.

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[36] On the periodisation criteria I refer to the complete study, where the reasons of the period analysed are explained more in detail. See I. Meandri, *International Recording*. And despite the fact that some parts of the production have been omitted. From the procedures I have considered, some stages only appear marginally. Their examination is not among the primary goals of my analysis, although they are important parts. The first of these is direct sound and the second major area is dubbing.

[37] With the technique of so-called *basette*, compact-cassette ($^1/_8$-inch tapes) are introduced to make background and ambient sound effects. See I. Meandri *International Recording*, paragraph 4.

Another example is Sel-Sync introduction[38] on 35mm magnetic perforated records. Here, on the contrary, technology unambiguously determines a change in practices. Having said this, no matter how inseparable the two aspects are, I think of this technical reconstruction more as a premise to a study on praxis rather than its actual accomplishment. The latter, indeed, would entail considering each production as an event, according to a method already set forth by Altman[39]. The relational network and the set of standard procedures engendering a praxis must be foremost understood in their idiosyncrasies. For example, each sound technician – and each sound technician in his relationship with a certain director, or a certain composer – makes a special use of recording equipment. This use has certainly something in common with the habits of other sound technicians; but without acknowledging these subtleties I doubt it would be possible to speak of a praxis, if not in an abstract sense. And this is a goal that my research – and, to the best of my knowledge, research in general – still seems very far from achieving.

The International Recording at Its Establishment: An Overview

In this short paragraph I shall mention some data on the factory at the time of its foundation with an overview of its departments, which can introduce the reader to the harder task of describing the equipment used.

In 1959, when this enterprise began[40], IR had a single recording stage (number 1), which alternatively operated as Mix Studio, and two other "dubbing" stages (Stage 2 and Stage 3)[41]. The company articles mention dubbing, music recording and mixing[42], but the term must not however be understood

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[38] Sel-Sync, or "Selective Synchronous" according to Ampex terminology which prematurely introduces this function on its records. Sel-Sync enables the recording head to be commuted into synchronous reading with the recorded material. But until the introduction of solid state Ampex, the Sel Sync would only allow the dubbing mixer to enter but not to exit on the spot during recording. What is new with Sel-sync designed by Shelley and Sbroscia is the chance to exit recording on the spot. This is an absolute innovation in Italy on 35mm perforated magnetic recorders. See I. Meandri *International Recording*, paragraph 4.

[39] Cf. *Sound Theory/Sound Practice*.

[40] Biondo (23 October 2012, Rome). The factory started its post-production activity in the early months of 1959.

[41] It is worth noting that studios are numbered according to the Italian practice. In American use, studios are labelled by letters. Fonoroma is an exception in the Italian field, as the facility adopts the letter system.

[42] IR company articles, consulted at Paolo Biondo's private archive, were drawn up on 20th September 1957.

as voice re-recording for the local release of a film in a foreign language (i.e. traditional dubbing). In Biondo's initial intentions the studios are, in fact, designed to support American productions in Europe for re-recording voices with the film actors, an operation defined in American contemporary procedure with the ADR acronym (Automated Dialogue Replacement, in other words Looping; for historical-technical reasons I shall use the term re-recording[43]). Dubbing stages in 1950s Rome – but it is also true for most European studios – are not always on a par with American technical standards[44]. Biondo's initial strategy aims at intercepting, through its Newyorker twin facility, headed by Mr. Hicks, the many American productions in Europe, providing local support to the re-recording. From 1959 until the end of the 1970s approximately, re-recording brought on a constant presence of American actors at IR, from Fred Astaire to Ava Gardner and many others; attendances which, together with those of Hollywood stars working at other factories and on Roman sets, help shape the atmosphere of *La dolce vita*. The traditional dubbing would gradually develop in IR alongside these re-recording activities.

The acoustic project was conceived by Michael Rettinger, a leader in the field of acoustics for large music recording stages and, according to what is reported by Paolo Biondo, former designer for Universal studios in Hollywood[45].

[43] Voice re-recording consists of film actors re-recording fragments of poor quality or segments which, for different technical reasons, could not be recorded on set. In American productions the actor guarantees re-recording as per the contract, as long as it is carried out within a limited time after working on set, so that the artist can be free for new productions. Thus American studios shooting in Europe must use local dubbing studios. Before looping on 35mm perforated magnetic tape, in IR voices were recorded in Studios 2 and 3 on Ampex recorders. The use of the ADR acronym is documented in literature only since the end of the 1960s (but for many Italian factories the acronym starts to be commonly used about a decade later). Before this date the American sound post-production facilities employed the term *looping*, which later coexists with the ADR acronym. The term ADR is first documented in SMPTE archives in 1968, i.e. when IR, for almost two years, had been using the Virgin Loop technique in Studios 2 and 3 (see the term first used by Richard E. Putman, *Progress Committee Report for 1967*, «Journal of the SMPTE», LXXVII, 5, 1968, pp. 481-532: 489.

[44] John P. Seaburne, *A Self-Contained 16mm Post-Synchronization Studio*, «Journal of the SMPTE», LXVI, 9, 1957, pp. 547-549, reports a «self contained 16mm Post-Synchronization Studio» prototype made for the EPA (European Productivity Agency) which, significantly, is considering self-contained systems for those European nations which do not have state-of the-art equipment for dubbing and post-synchronisation (i.e. voice re-recording), a fact further confirming what Biondo (23 October 2012, Rome) has reported so far.

[45] When Rettinger signed the project of IR studios he was acoustic engineer at RCA Broad-

Stage 1 (Fig. 1) intended for recording and mixing, is located at 0.22 m above ground level, corresponding to via Urbana, where the main entrance is. It stretches out horizontally to 21x12 m and it has a wooden floor made of vertical dovetail slats in solid cherry wood, an expedient devised to eliminate involuntary squeaking from musicians' and operators' movements. The detail in vertical section of the floor (Fig. 1, above), though difficult to interpret, shows the series of levels of different materials, among which we must single out a layer of sand, which is meant to disconnect the planking surface from the floor in order to stop vibrations from propagating to the stages underneath, and vice versa[46]. According to what Paolo Biondo reports, the walls are planked with a wainscot in perforated masonite, 1 m high; with mineral wool upholstered with juta canvas (0.70 m high) and with plywood veneered semi-cylinders (2 m high). The ceiling of Stages 2 and 3 and the floor above are separated by a cavity. In the months following the opening of Stage 1 a marble slab was set, removable if needed, used by foley artists to record footsteps[47]. Moreover, a portion of the floor in Stage 3 was modified with materials of different acoustic performance used by foley artists (besides the original wood on the floor: marble, cement, linoleum, ceramic and a hole filled with sand). Stages 2 and 3, are provided with isolating soundproof rooms for actors – the so-called *gabbie* (lit. cages) in professional jargon – which allow a dry sound recording, except for a minimum quantity of natural reverberation[48]. This

cast and Communications Products Division, based in Hollywood. Author of several articles and handbooks on acoustics in recording studios, Rettinger also worked on developing new loudspeakers, microphones and magnetic heads and he specialized in the acoustic design of Scoring Stages and Motion Picture Theaters. He was the author of numerous projects in the States and in Europe, such as the Capitol Tower (LA) in the Fifties and Hollywood's Cinerama Center Theater, in the Sixties. At the current state of research, no validation could be found on his work at the Universal studios, on which Biondo (23 October 2012, Rome) reports. However, Rettinger is documented as an acoustics consultant very active in Hollywood, who carried out important studies at least from 1935 onwards, as a main designer or consultant. This biographical note is taken from an editorial article that appeared in the «Journal of the SMPTE» in 1966, when Rettinger retired (*Biographical Notes*, «Journal of the SMPTE», LXXV, 5, 1966, pp. 534-536: 534).

[46] I would like to thank Gabriele Piccablotto (Polytechnic University of Turin) for his consultation, which made me understand important details on the studios acoustic project.

[47] At this time Guglielmo Barberini, Renato Marinelli and Tonino Caciottolo were used to recording foley sound in this studio. This was so until the end of 1961, when they were joined by the new generations of Roman foley artists – Barberini, Caciottolo and Marinelli – who were among the most recognised foley artists of the time.

[48] This is contrary to what we can sometimes experience through careful listening to coeval Italian dubbing, where voices often happen to be accompanied by the persistent back-
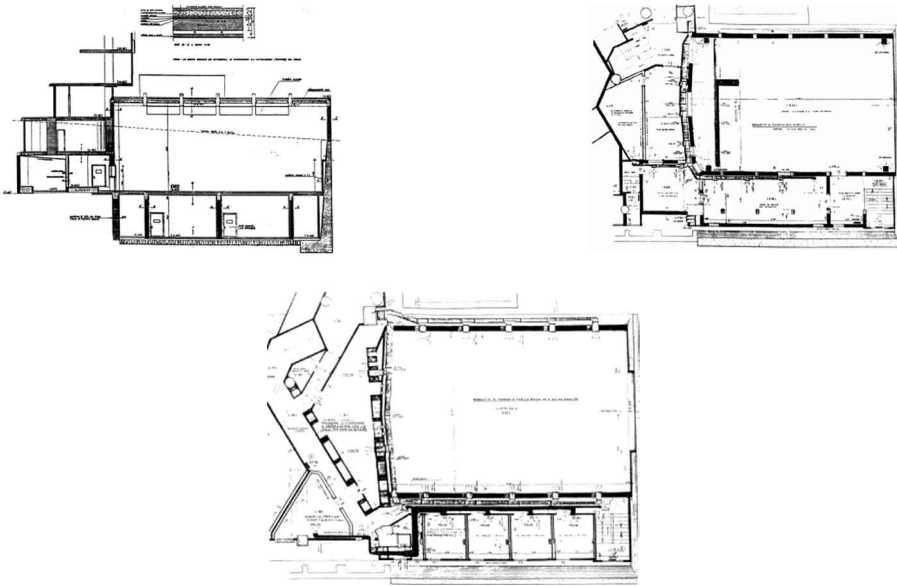
Fig. 1.

IR, 1959: lateral plan. Studio 1 can be seen in cross-section, with a detail of the anti-vibration devices used for building the floor (on the top). To the left, behind the dividing glass at 0.60 m above ground level the Music Booth is located, and behind it, at 0.27 m, the soloist room. The Projection Booth is located at 4.10 m, Studios 1 and 2 at - 4.40 m. Second picture: horizontal plan at 4.10 m above ground level. The Projection Booth is opposite the Music Room, with the walls forming an obtuse angle near the centre. To the right of the Recording Stage, facing the screen and always on 4.10 m level, there are four editing rooms with the cutting machines. Third picture: horizontal plan at 0.22 m above ground level. Music Booth is opposite the Recording Stage and is separated by a glass in the middle. To the right of the Recording Stage, opposite the screen and always at 0.22 m, there is the Choir Stage. Two *echo-chambers*, with asymmetric walls and floors, and walls covered in foil, are placed behind the Projection Booth and behind the Music Booth (Source: photostatic copy of the informative leaflet of CNAIAF manufacturing company, IR archive in Rome, courtesy Paolo Biondo).

is among the fundamental prerequisites[49] so that the voice, superimposed on a correct background, can be substituted for the direct sound voices; or

ground reverberation of the dubbing rooms where they were recorded.

[49] Together with the choice of identical, or at least comparable, microphones to match the acoustic performance of the ones used for direct sound voice recording.

so that it can be processed in the echo chamber and filtered in console to simulate the reverberation of different ambients. In both cases this made it possible to obtain a "realistic" effect which, according to the aural codes of the medium, minimises or completely erases all trace of manipulation.

Work is organised in departments. In the Projection Booth (henceforth Stage 1 Projection Booth) are located the projectors and the 35mm tape players for the tracks (colonne) destined to pre-mix and mix, the so-called teste sonore (sound heads). In the Music Booth we find the Ampex records for music recording – this is done on ½-inch and ¼-inch tapes, the latter currently called *nastrini* (little tapes) – and the speakers for playing back the recorded tracks.

After the opening, in what in Rettinger's original project is conceived as the Choir Stage – but which was never to be used as such, since it is not customary for Italian recording procedure to separate the orchestra from choirs[50] – there are the records for 35mm perforated magnetic tape meant to receive the output from the music mixing console, located in the Music Booth, and the equipment used to transcribe the field and direct sound material (recorded on ¼-inch tapes) and the tapes coming from the dubbing stages – in 1959 the latter were recorded on mono Ampex, on ¼-inch tapes. These materials are transcribed on 35mm perforated magnetic tape, so that they can be loaded on the sound heads in the Projection Booth, after being synchronized in the cutting machine (*moviola*). Customarily, this room is referred to as Recorders Room (*Sala Record*, a name which sometimes co-exists with Transcription Department, *Reparto Trascrizioni*).

This research has considered these stages one by one and in connection with the work of other departments, trying to cover the post-production cycle in the most complete way possible. Furthermore, I have given an account of the factory technical evolution from its opening to 1969, at the dawn of the multitrack recording era. Although I have gathered detailed information on the following periods, an account of what happened afterwards deserves a monographic study.

In conclusion, we may attempt to grasp the dizzying events of the technological change from the end of the 1960s to our day, in a bird's eye overview as it was experienced in this facility. When multi-track recording was introduced, a new phase began, tackling head-on the bottleneck of the entire post-production process: the limitations of optical sound. Hence the re-introduction, with varying results and for almost a decade, of CinemaScope's 4-track

[50] The small window from where the choir conductor can see the podium, visible in the original plan, is therefore dimmed and covered with soundproof material.

stereo magnetic sound[51] – the «frozen revolution»[52]. Fox experimented in

[51] In other words, we see the re-introduction, since the early 1970s, of copies released in the so-called *magnetico pistato* format, i.e. 35mm positive copies where four magnetic strips are pasted. The film final mix is recorded on these 4-tracks through a purposefully modified instrument (cf. "Bomar device" in I. Meandri, *International Recording*). This is a format Fox introduced in the Fifties (CinemaScope's 4-track 35mm "stereo magnetic sound") which then fell into disuse at the end of the same decade, eclipsed by 70mm widescreen systems (Todd-AO, MGM Camera 65, Super Panavision). The latter formats had sound released on 6 magnetic tracks. According to what Biondo reports (25 October 2012, Rome), since the magnetic track was re-introduced the positive copies were sent to Studio Barbieri, a facility that managed the so-called *pistaggio* process (*tracking*, i.e. the process of gluing the 4 magnetic strips to the 35mm film positive) which is obtained through specific machines. Savina reports (30 October 2012, Rome) that only Italian copies were used to paste the magnetic strips – which often caused problems because the tracks would detach after numerous runs on the projector – whilst for the American copies the magnetic strips were emulsified on the film, with a slightly inferior audio quality, but guaranteeing more safety. The standard 35mm original for this format is slightly different, using smaller dragging perforations (CS perforations, otherwise known as "Fox holes") to make enough room for the magnetic strips. That is also due to the fact that, when tracking was resumed in the 1970s no cinema would have accepted spending the amount of money needed to change the reels for CS perforations. The "new" 1970s tracking thus uses standard 35mm film perforations and consequently places the tracks according to a different standard to CinemaScope's 4-track (Biondo, 25 October 2012, Rome). This format co-exists with the production of copies on optical mono-aural variable area format and also with the coeval revival of widescreen 70mm formats. In the same period IR also released movies on 6-tracks, as is the case of *E.T. – The Extra-Terrestrial* (1982, by Steven Spielberg), 70mm blow-up version. The transcription of the mix master on 6-track formats were not produced in the IR but made in London (Biondo, 25 October 2012, Rome). It is likely that by this date the 6 discreet tracks were used according Ioan Allen's recent proposal for *Apocalypse Now* (1979) – basically a forerunner of Dolby 5.1 – and here well described by Robinson, who gives the details on the CP200 processor's settings: «In most instances, 70-mm magnetic tracks are not recorded at present with six discrete signals as used in the 1950s on the original Cinerama and later Todd-AO releases. Since the mid-1960s, tracks two and four of a 70-mm film without Dolby noise reduction have been a simple mix of the adjacent tracks (referred to as a "spread"), a practice which degrades the separation. Because of this, Dolby-encoded prints do not use these tracks for program, but carry low frequency information (below 250 Hz) for use in bass extension schemes to compensate for deficiencies in theater loudspeakers which traditionally have been designed for efficiency and not linearity or extended frequency response. For playback of these films, low pass filters are switched into circuit in tracks two and four. Recently, following the original idea of Ioan Allen and subsequent development by him the unused part of the frequency spectrum on these tracks has been utilized to provide stereo surround» (David Robinson, *The CP200 – A Comprehensive Cinema Theater Audio Processor*, «Journal of the SMPTE», XC, 9, 1981, pp. 778-785: 784).
[52] On the introduction and premature waning of CinemaScope's 4-track 35mm «stereo magnetic sound» see the essay by John Belton, *1950s Magnetic Sound: The Frozen Revolution*, in *Sound Theory/Sound Practice*, pp. 154-157.

the 1950s (circa 1971-82). At the same time Federico Savina's original proposal (the *magoptical*)[53] was introduced, alongside the all but straightforward transition to analog Dolby, which would require at least five years to take over (1977-82). Meanwhile innovation affected magnetic sound, with both procedural improvements – the introduction of fast records (circa 1988-89)[54] – and technical-qualitative developments. It was the swan song for analog magnetic recording. According to some – as argued by Argentini[55] for example – analog magnetic recording reached in this period an unparalleled degree of perfection. Therefore, the most contradictory and difficult stage of this matter once more starts from the magnetic – the linear digital magnetic tape, with innovations from Japan and the States[56] – affordable and functional technologies, which were to bring in new competitors on the scene. At the same time, optical digital formats (the Dolby Digital, then the SDDS,

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[53] Briefly, this is a method developed in IR from 1973-74 to circa 1982-83 which, upon optimising the position of tracks on the 35mm, allows the transcription of the film mix on 4 magnetic tracks though maintaining backward compatibility with the mono-aural VA bilateral optical format. In this case the optical head reads half bilateral track, the same optical track being covered for the other half by one of the four magnetic strips. This method helped IR save on multiple copies, so that one single copy would serve the cinemas equipped with projectors with magnetic 4-tracks sound heads as well as the cinemas with traditional optical heads.

[54] That is to say 6-tracks Magna-Tech records/players for IR.

[55] I take this opinion from an interview with Livio Argentini (Argentini, 19 October 2012, Rome), the founder of Elettroacustica Professionale (now Audioline) and a well-known custom high-end equipment designer for the recording industry. In the past years, at the request of Italian and European studios, he has resumed manufacturing AD/DA (analogue-digital, digital-analogue) converters and analogue mix devices which, according to what he has argued on several occasions, guarantee better quality compared to digital mixing. This is a very complex subject – connected to the limitations of digital sampling, to current sampling rate levels and bit depth – which cannot be examined here. What I intend to underline is that now some areas of the professional environment (especially the music studios) are undergoing a significant backlash in favour of analogue audio.

[56] Very briefly, in this complex transition from analogue magnetic to digital magnetic, IR adopted the Tascam DA-88 systems; in other studios, at around the same time, Akai systems with magnetic-optical support were employed, mostly used by dubbing studios and by some sound dubbing studios (for instance New Digital). With the use of Tascam DA-88 systems the "tapeless" revolution came, which would lead, after a very short testing period of the Pyramix (Merging Technologies), to the introduction of Pro Tools (2004 circa), a system which for a short time worked alongside the Tascam recorders, and then became the only DAW used in the facility. This summary, as most of the information contained in this paragraph, is taken from the interviews with Basili, 19 October 2012, Rome; Turchetta, 10 October 2012, Rome; Sbroscia, 27 September 2012 and 25 October 2012, Ostia; Volpato, 17 October 2012, Rome; Croce, 16 October 2012 and 30 October 2012, Rome; Stefani, 29 October 2012, Rome.

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and the "modern edition of Vitaphone" i.e. the DTS disc) would progressively be introduced[57]: the Dolby era was at its pinnacle.

With the D-Cinema[58], the digital revolution and the *technological convergence*[59]

[57] A 35mm frame with the sound formats used today, except for a gradual marginalisation of DTS and SDDS, contains: 1) DTS (Digital Theater System) synchronisation track; 2) Dolby SVA analogue track (Lt-Rt encoded); 3) The Dolby Digital 5.1 encoding is lodged among the dragging perforations, on the left side (S-side, i.e. *soundtrack side*); 4) On the far left and on the right of the picture, SDDS (Sony Dynamic Digital Sound) sound encoding. Two proprietary systems (Dolby Digital and DTS) support multichannel format 5.1 and 5.1 Surround EX, while Sony SDDS supports 5.1 and 7.1 formats. DTS prints on film only the track synchronising the projector, with the audio information memorised separately on CD. SDDS digital information is also printed on the right side of the film since the two areas are mutually redundant (*cross redundancy*). Each side contains backup information for the opposite side, in case the deterioration of a portion of the film makes one of the two illegible, with the following scheme: P Side (Picture Side) = *Center, Left, Left Center, Left Surrounds* plus the backup channels the system recalls in case a track cannot be completely read (a mix of the *Right + Right Center + Right Surrounds* channels) and a *Sub-Woofer* backup. S Side (Soundtrack side) = SW, R, RC, RS plus a mixed backup of L+LC+SL and C backup. On the right of Dolby Digital the stereophonic analogue optical track (Dolby matrix encoding) is usually recorded, which is nowadays a backup track in most films. The cinema audio processor will commute into the analogue reading only when the digital system breaks down or a deterioration of the film makes the digital information suddenly inaccessible.

[58] D-Cinema (Digital Cinema) is the film digitally distributed and projected, a process abolishing the use of 35mm positive as a medium hosting images and digital and analogue optical sound. While 35mm negative for shooting still is a viable option for the director, positive printing is experiencing a rapid decline because of D-Cinema. Obviously, the audio transcription on optical negative is in this case not necessary: digital audio is linear PCM (according *SMPTE 428-2* standard) and is contained, as well as image, in a series of MXF files with relative index metadata in XML format. MXF and index files are assembled according the specific LLC notes as DCP (Digital Cinema Package). The film is distributed in several ways, usually by broadband download. The film is thus stocked at the cinema storage centre and, protected by sophisticated anti-piracy keys, projected with digital projectors at given dates and times. The transition to D-Cinema is currently ongoing, considerably slowed down by the economic crisis and subject to harsh criticism from many directors and operators in the field. Many technological, political, economical causes converge in supporting the transition, but it is still premature to take the outcome of this epoch-marking transformation for granted.

[59] According to Henry Jenkins' definition: «By convergence, I mean the flow of content across multiple media platforms, the cooperation between multiple media industries, and the migratory behavior of media audiences […]. I will argue here against the idea that convergence should be understood primarily as a technological process bringing together multiple media functions within the same devices» (Henry Jenkins, *Convergence Culture: Where Old and New Media Collide*, New York, New York University Press, 2006, pp. 3-4). With this Jenkins updates an old massmediology paradigm which turned out to be misleading. However, in his analysis, he does not rule out completely that the result of digitalisation can

have made the dream, film sound has always longed for, come true: to get rid of the "film".

A First Appraisal: Technique and Dispersion

Technical innovation left an unmistakable mark on film sound, even though it is extremely difficult, both intellectually and technically, to understand where and how this happened, and which are the most fundamental turning points. Here a game of mirrors refers us back to our naturalised perception of aural artefacts: and this is the way in to an ethnomusicological deconstruction of assumptions and underlying meanings of a sound culture. It is difficult to grasp this shift over a short time but we know that this has undoubtedly happened. For instance, technological convergence has caused, in several cycles and in not linear phases, the end of a self-sufficient and proud era, where every factory was a sonic world of its own (not impenetrable, following standard procedures, but with productions strongly marked from the aural point of view).

The *backlash to analogue sound* I have mentioned[60], which today some areas of the recording industry are experiencing, is the most blatant example of a reaction to a more and more marked uniformity in sound practices. In this change we must see an attempt to go back to a systematic device customisation which can make studios have a distinctive trait in productions, superimposing their recognisable aural signature. As I have hinted at[61], the music industry set the pace of technological innovation until the first half of the 1970s. The Dolby era, from the second half of the 1970s, through a complex series of stages, reversed this supremacy. Today, this renewed tension to *hypermediation (opacity)*[62]

tend to concentrate different media functions in one, or better, few media (which share the capacity of elaborating multimedia information, from personal computer to smartphones, to tablets). Cinema sound underwent this convergence since the mid-1990s, with a troubled phase between the end of the 1990s and the beginning of the 2000s, adopting different competing systems. A stabilisation has occurred since 2004, when the majority of Italian (and worldwide) factories adopted Pro Tools DAWs (Digidesign, already at the time of Avid brand) which is today the *de facto* "standard". Some processes resist convergence; among them, strong resistance came from optical transcription of film sound – the old medium *par excellence* – the obstacle that today D-Cinema is trying to overcome.

[60] Cf. note 55.

[61] Cf. note 24.

[62] In the meaning of Jay David Bolter and Richard Grusin, *Remediation: Understanding New Media*, Cambridge (Mass.), The MIT Press, 2000. The authors define *remediation* as «the representation of one medium in another» (p. 1); «Where immediacy suggests a unified visual space, […] hypermediacy offers a heterogeneous space, in which representation is conceived

– coming after years when digital, with often unreflected features, posed as the herald of an illusory *immediacy (transparency)* – is it maybe the dawn of a new leadership of the recording industry?

Granted that scientific research might be able, or willing, to converge on these topics, with a collective effort it may be possible one day to consider the history of technological change in more precise detail than what I have been able to produce in the results of the complete study (to which the reader is referred at the beginning of this paper). However, the degree of complexity of film post-production may not guarantee the success of this enterprise, or may leave many aspects exposed. And, aside from this difficulty, the crux which clearly emerged during research is that an excess in detail may even be misleading for a cultural understanding of productive systems and their distinguishing traits, and for the very ambitions of a better philology. We must, in other words, consider the level on which to set the observation and be clear on what kind of horizon we are addressing; not by giving examination up, but by conducting it aware of the limit set to our knowledge by the intrinsic ephemerality of these processes.

of not as a window on to the world, but rather as 'windowed' itself – with windows that open on to other representations or other media. The logic of hypermediacy multiplies the signs of mediation and in this way tries to reproduce the rich sensorium of human experience» (p. 36); «In all its various forms, the logic of hypermediacy expresses the tension between regarding a visual space as mediated and as a 'real' space that lies beyond mediation» (p. 41).

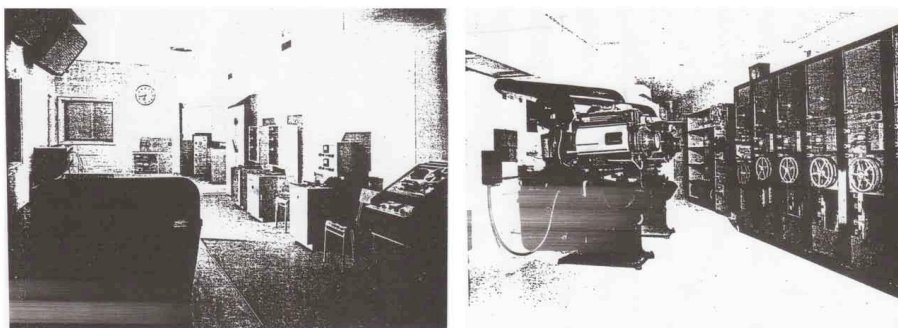## *Some Images of the Research*

Fig. 2.

I: 1959 Music booth and Projection booth (Studio 1) few weeks prior to the opening. The control room, located under the projection booth, at level 0 contains two mono Ampex models (one not visible in the picture of which, one with 350 electronics with octal base valves, the other with 351 electronics with noval base valves); two 2-track Ampex 351 models (one not visible in the picture) and two 3-track Ampex models on ½-inch tape (300-3, with 351 electronics and Sel-Sync units). The control room console was a 12 channel made by Westrex Italia. According to several sources, this was the first fader console installed in an Italian studio. A mechanical system of wires, moved by the fader, acted upon a Daven potentiometer, already in use in the RCA consoles. The preamplifiers, compressors and filters were manufactured entirely by RCA: BA-21A preamps, BA-23A amplifiers, and BA6 compressors. The control room speakers were three Tannoy Gold (15" duo cone) models arranged in horseshoe formation around the console, amplified by three McIntosh 60W. We can glimpse the electronics of the optical sound-on-film recorder, a variable-area RCA Photophone – galvanometer system. II: The projectors are two IPC Simplex models. Only partially visible on the right are the twelve records for 35mm perforated magnetic tape – RCA make, Film Phonograph model – to which must be added one optical head, visible in the picture (third from last rack in the back). The last rack is a record made by RCA. On the second from last rack there is a Tannoy loudspeaker, from which recordists in the booth monitor the audio of the sound heads (Source: photostatic copy of the informative leaflet of CNAIAF manufacturing company, IR archive in Rome, courtesy of Paolo Biondo).
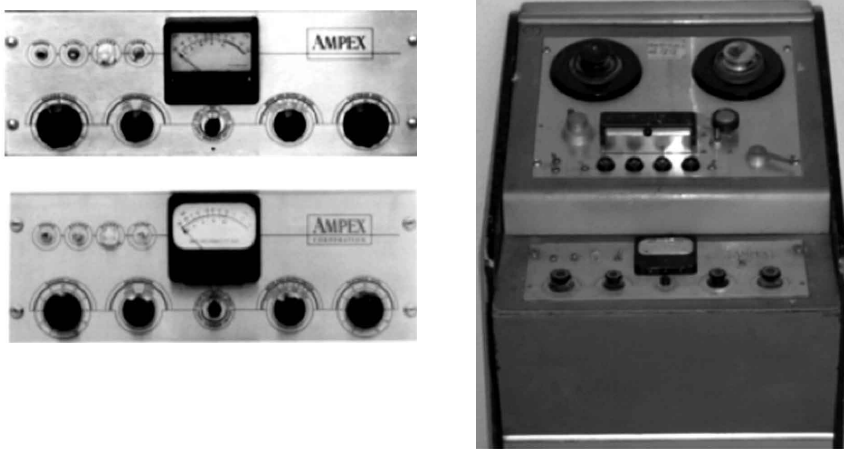
Fig. 3.
I: frontal of 351 mod. recording electronics, on the top, and of 350 mod., on the bottom. Please note the characteristic hole in the frame and under the input switch of 351 mod. and exclusive to the last one. II: Ampex mod. 350 belonged to IR (photograph by Marcello Braca, courtesy). Please note on the electronics frontal, underneath the "Ampex" sign, there is a switch not present on the original model and, on the left of the tape transport control cluster, the presence of two switches absent in the original model (Rangertone control module).

Fig. 4.
I-II: Light Valve (serial no.: 50), one of the two modified four ribbon light-valves used by IR. Simon Daniel Sound business card can be seen – the only company in the world which can make repairs and changes to this very delicate component (photographed on 17th October 2012 at the Technicolor factory, courtesy of Fabrizio Nisi, Technicolor Rome)[63]. III: Sound camera, orig. Westrex 600-series, modified for Dolby SVA and Dolby Digital. On the right there is a monitor of the pc unit, on which the QC (quality control) for digital formats is run. IV: Sound Camera orig. Westrex 600-series modified for Dolby Digital and DTS, with the SDDS moduled placed between the 600 m reel-holder and the chassis hosting Dolby SVA and Dolby SR-D modules. Detail: technician Antonio Croce (CDC SEFIT Group) stamping the optical negative for recognition of the start point in the darkroom. On the left there is part of Nuoptix Inc. electronics today used for sound camera control (photographed on 16th October 2012 at the CDC SEFIT Group, Rome, courtesy of Antonio Croce). V: detail of the optical negative (photographed on 17th October 2012 at the Fonoroma facility, Rome, courtesy of Fonoroma).

[63] Fabrizio Nisi is today one of the Technicolor administrative managers and a former specialised technician for transcriptions on optical at the historical Technicolor factory in via Tiburtina. His father, Luigi Nisi, worked for IR since the early 1960s to the end of the 1990s, as a technician in charge of transcriptions on optical (Nisi, 17 October 2013, Rome).

Fig. 5.
Renato Marinelli in IR Studio 1, 1961-62 circa (Marinelli Effetti Sonori archive in Rome, courtesy of Marco and Massimo Marinelli). In the middle: the editor Enzo Alabiso[64].

[64] Biondo (2 March 2013, Rome) recognises the editor Enzo Alabiso as the man with the striped shirt. It has not yet been possible to identify the other people in the picture.

Fig. 6.
I-II: two pages from the catalogue of the impressive backgrounds archive of
Marinelli Effetti Sonori, with a detail of «Manicomi» (i.e. Asylums) entry and
of «Canali» (i.e. Channels) entry. Please note that some of these backgrounds
(asylums are a good example) document sound realities which no longer exist.
Under «Canali» some of the listed effects are taken from original effects of
the film *Eva* (recorded by the field recording technician Amelio Verona of IR
Services). III: Portion of the specials archive (period cars). Please note among
the Aurelia 2500 (B24 GT 2500) effects the presence of a classic sound of Italian
sound: the «colpi di clacson» (i.e. honking) recorded by Italo Cameracanna
during the effects post-production for the film *Il sorpasso* (1962, by Dino Risi).
IV: Portion of Anzellotti catalogue containing the original effects used for the
film post-production of *Nostalghia* (1983, by Andrej Tarkovskij) and *Il fiore delle
Mille e una notte* (1974, by Pier Paolo Pasolini). Courtesy of Marco and Massimo
Marinelli and of Massimo and Luciano Anzellotti.