

## Perspectives

### An Interdisciplinary Approach in Forensic Sciences: Etiology, Methodologies and Importance of Forensic Linguistics

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#### Abstract

This paper aims at inscribing Forensic Linguistics within the variegated field of Forensic sciences. After a deep and meticulous description of the state of art of Forensic Linguistics from 1960s until now, we propose all of the methodologies, concerning both the written and the oral facies of this linguistic discipline applied to Forensic field, and so we focused on methods used in transcriptions and in Speaker and Speech Recognition analyses. Then, the discussion outlined the importance for Forensic Linguistics to be considered as a proper scientific discipline: in this way, its methods and its results could be tested and replied by the scientific community, by verifying the uncontested principle of scientific cumulability. Our hope is that academic and training courses ad hoc as regards Forensic Linguistics could be established as soon as possible and that this sphere of research will be handled with an interdisciplinary approach. We think that interdisciplinary competences are necessary to deal with a huge discipline, such as Forensic Linguistics and to conduct linguistic research (e.g. Forensic transcriptions, Speaker and Speech Recognition) in the best way.

**Keywords:** Forensic Linguistics; Speaker Recognition; Wiretappings; Forensic Linguistics Methodology.

#### Abbreviations

SR: Speaker Recognition;

FL: Forensic Linguistics;

GIP: Giudice per le Indagini Preliminari (In Italy), Pre-trial Investigating Judge (In English)

#### Introduction

Forensic Sciences have gained a great scientific importance and a huge popularity too, in the last five decades. They have constituted a crucial tool in resolving many criminal cases and each subcategory developed, such as Forensic Dentistry, Forensic toxicology, etc. has been a further particularization of fields of research that, traditionally, have been locked with-

in their monodisciplinary sphere. Among them, Forensic Linguistics *sensu largo* has developed and several attempts for a univocal scientific and methodological definition have been tried, even though their meanings have not always included all of the basic semantic nuances, especially concerning methods and the objects of research. In this paper, we aim at providing a proper and a precise description of FL, by avoiding any kind of confusion as regards definition, methods and

object of analysis; with the mention of many striking events that gave birth to many methodological and analytic questions and to which we tried to answer, we want to trace a definitive FL scientific path, at least as far as concerns the last fifty years. With a deep investigation concerning FL, we put in evidence the variegated competences that a Forensic linguist must own and the necessity of an interdisciplinary approach through which FL must be seen. Without ambiguities concerning this Forensic discipline, an effective scientificity is finally given.

### Forensic Linguistics: The State of Art

Forensic Linguistics is a discipline inscribed in Linguistics *sensu largo*, specifically in the subfield of Applied Linguistics, and also in that of Forensic sciences. Its scientific interests concern both written and oral texts that, somehow, are involved within legal context [1,2]: <<literally any test is somehow implicated in a legal or criminal context then it is a forensic text [...]>>. Forensic Linguistics has been described in Linguistics Encyclopedia of the Routledge (2010) in this way: <<forensic linguistics help court to answer three questions about a text – what does it say, what does it mean and who wrote, typed or authored it?>>, by confirming a strong interest towards written texts. The first study dates back to 1930 with a research conducted by Bryant upon words of legal texts. In 1960 Wetter published a study about intrinsic meanings of sentences written by Judges whereas, more than twenty years later, Levi (1982) wrote the first bibliography concerning Forensic Linguistics [1].

The first time that Forensic Linguistics was effectively used in a courtroom, as a means of probative research, was in 1968 when Jan Svartvik, by publishing a research [2], showed that a modest grammatical style could become effectively a judicial proof. The accused, Timothy Evans, was considered innocent after that linguistic analyses were conducted.

The discipline became famous worldwide with Unabomber [3] case that led to the imprisonment of Theodore Kaczynski, thanks to the evidence given by words and their use in context, that helped identifying the criminal univocally. Malcolm Coulthard, after this striking judicial case, published a work [4] on the American journal Applied Linguistics where he underlined the necessary and evident correlation between Forensic Linguistics and Applied Linguistics.

It is evident that the first identifications were conducted upon written texts and that a new scientific enthusiasm towards Forensic Linguistics arose. First closeness to Hard sciences, so, were created: let's just think to Kersta who wanted to put the neologism voiceprint [5], created by him, and the concept of linguistic DNA, close to the keywords dear to Genetics and Forensic Genetics, i.e. DNA and fingerprint. Other linguists [6] supported these ideas and two protocols developed, one created by VIAAS (Voice Identification and Acoustic Analysis Subcommittee) that belonged to International Association for Identification and the other by FBI. Meanwhile, Forensic

Linguistics continued growing up in importance with another crucial event of Western history: the Watergate Scandal. In fact, it was the first striking episode that started with an illicit wiretapping [7] that led to the resignation of Richard Nixon, the President of the United States of America, in 1972. Until 1990, however, US Court accepted speaker recognitions resolved thanks to the application of the protocols mentioned above even though Nola [8], since 1983, outlined his doubts as regards the application of voiceprint method in SR. Some years later, the Court of the State of California promulgated a sentence that stated:

<<That the aural spectrographic analysis of the human voice for the purposes of forensic identification has failed to find acceptability and reliability in the relevant scientific community, and that therefore, there exists no foundation for its admissibility into evidence in this hearing pursuant to the law of California>>.

After the sentence of the US Supreme Court concerning Daubert vs. Merrell Dow Pharmaceuticals Inc 1993 case, each new theory nowadays has to satisfy criteria of scientificity, i.e. each theory or technique used must be tested, published or submitted to a peer review; has to foresee and declare its potential error rate; and lastly must be accepted by the scientific community.

The epistemological excursus here proposed supports the new definition of knowledge, that of interfaces, that has to be constantly made up of intersections between disciplines and competences. Forensic Linguistics is a perfect example of interface and of scientific sharing of competences and methods that belong to Law, Linguistic Sciences, Physics, Acoustic Phonetics, Signal Analysis, Statistics, Computer Sciences, Telecommunication Sciences and Philosophy of Language.

So, Forensic Linguistics, this broad medley made up by interdisciplinary competences, has gained a significant importance, given both by mass media and by massive investigative use, in the last fifty years and it has come at the heart of many scientific interests. Its methodologies, concerning both transcriptions and oral questions, and its problematic issues have to be faced in order to understand its key role in Forensic sciences.

### Forensic Linguistics Methods

Currently, after fifty years of productive activities, the scientific consensus and the specialized international literature have tried to differentiate the aims of Forensic Linguistics by assigning the study of written texts to FL *sensu stricto* and by assigning the study of oral items to Forensic Phonetics: this taxonomy doesn't seem to be fully accepted though.

As far as concerns methods, used respectively by Forensic Phonetics and Forensic Linguistics, that will be discussed in the following paragraphs, we aimed to put in evidence their methodological relevance and to differentiate each applicative

process from the other.

### Types of transcription and their aims

Forensic Linguistics is made up of two different, but complementary, sections: the written and the oral facies. The main outcomes of the written interests of Forensic Linguistics are transcriptions. In fact once the recording is done, it is possible to write a report of the audio with different modalities and also after many years that the actual recording was taken. This is, so, a perfect example of oral information that overlaps the written dimension. Transcription becomes an abstraction, a product of precise choices made by the transcriber who selects information to put or to omit in the report. We identified six different types of transcription:

1. Transcription based on memory. This kind of transcription consists in transcribing conversations that took place in a moment antecedent to the one of writing. The written text produced can contain information very different from the one really pronounced in the oral act. An example is an article concerning the description of a criminal case [9] in which the journalist reported a conversation heard some hours before and that proved the complete misunderstanding of technical consultants' roles (Prosecution confused with Defense) and the bad translation transcribed;
2. Transcription for notes. An example of this type of text is made up of the notes written by students during University courses. Transcription for notes represents one's own concept regarding important elements of a specific event, e.g. a lesson [10];
3. Regular transcription. It can be divided in partial and complete regular transcriptions. Its aim coincides is that of transcribing the speech heard in the most faithful way;
4. Forensic transcription. Differently for the regular transcription, the Forensic one can't be contested because it is not submitted to a debate and tries to make explicit a reality voluntarily kept secret by (wiretapped) speakers. Forensic transcription reconstructs a reality, an event, a proof and requests specific competence to the transcriber [11]. It is deeply interested in significant and leaves the interpretation of the transcription to judges or lawyers. In fact, it's very common for us to perceive meanings of things we don't actually listen, such as when we listen to 'uhm' or to a pause longer than a normal one in the phrase 'Bring me those PAUSE shoes!'. This motivates the need for a forensic transcription to be intended theoretically but mainly practically. The expert must know that

his written report will have real consequences in the resolution of criminal enigmas or in the reconstruction of a truth. Emblematic was an Italian case of murder where a Moroccan male was imprisoned because the Arab verb for "answering" was translated [12] as "killing" in the transcription. So, a Forensic transcription is the graphic, written representation of an oral conversation between two or more people that are wiretapped through telephone callings, bugging devices, etc. This conversation is, so, considered as a probative evidence in judicial cases [13];

5. Transcription of disputed utterances. These utterances or, more often, single words contained in them are disputed in courtrooms and their interpretation differs from the parties involved in a case. Many cases depend, in fact, on single vowels or on single words. That's why the transcription of disputed utterances should include all of the types of transcription discussed so far plus the phonetic one *sensu stricto*;
6. Phonetic transcription. This last of transcription is used for writing down each oral enunciation and allows speakers all over the world to read univocally the same enunciation. The need for an alphabet that had a biunivocal correspondence between the symbol used and the phone produced soon was born and the first version of IPA [14] (International Phonetic Alphabet) saw its birth on 1988.

Transcriptions come to represent the main written object of Forensic Linguistics studies but we want to remember also that FL is interested in the study of meaning [15], the correct linguistic interpretation of contracts and laws, Writer recognition and whatever concerns morphological, syntactical and lexical elements that can be attributed to a precise author.

### Speaker Recognition Methods

The oral facies of Forensic Linguistics, whose analytic object is usually associated to wiretappings, very common in criminal cases and way too present on newspapers' pages, has a proper methodological apparatus that can be divided in three different macro categories: aural-perceptual, parametrical and completely automatic. In the first group, recognized methods are:

1. aural method through naïf listeners;
2. aural method through a small sample of trained phoneticians who can make:
  - a) comparisons of single vs. multiple choice;

- b) comparisons of familiar vs. unfamiliar voices;
3. Panel approach method, comparison of pairs of sentences and answers in percentage [16];
  4. Direct processing, in which the expert listens to an entire audio and then identifies the voice;
  5. Aural-perceptual approach, in which the expert is asked precise information as the measurement of pitch, etc.;
  6. Aural-spectrographic identification, in which the expert confronts and compares sonograms and audios at the same time.

As far as concerns these methods, many limitations arise: experts do not own the same abilities and some voices are more identifiable than others.

Automatic methods, instead, are founded exclusively upon objective parameters, far from any articulatory bound. For example, the use of the third and fourth cepstral coefficient doesn't have any articulatory correlation, even though Clermont e Itahashi (1999) show that vocalic quality can be interpreted as a variation of the second and third cepstral.

Ladefoged points out that men and computers recognize voices through different processes, so it's very logical that aural-perceptual and automatic methods have totally different parameters.

Due to the fact that the Judge, in the courtroom, prefers the evidence given by parameters tied to articulatory conformations and thanks to the Acoustic theory of speech production, we can affirm that some acoustic parameters can be interpreted acoustically. So, parametrical methods have develop starting from this statement and, in order to be defined objective, they have to rely upon acoustical parameters, strictly dependent on the voice of the speaker, that are highly characterizing. The number of parameters is small and their measurement is not that complex [17].

An Italian work [18] has showed another possible classification of methods:

- Methods founded on static data that include semiautomatic methods, parametrical methods and some automatic methods as the one based on dissipative function;
- Methods founded exclusively on dynamic acoustic data that include semiautomatic and automatic methods [19].

### Speech Recognition Methods

Speech recognition research began in the late 1950s with the

birth of digital computers. With the aid of tools that could capture and analyze speech, such as analog-to-digital converters and sound spectrograms, the computer allowed researchers to find scientific ways to extract representative features from speech that allow discrimination among different words. The 1960s saw advances in the automatic segmentation of speech into linguistic units and the following years saw a massive literature dedicated and many projects developed [20,21].

### Discussion: The Importance of Forensic Linguistics

Forensic Linguistics has come to the fore recently thanks to many events that have highlighted the increasing number of requests concerning wiretappings, expert reports, phonic comparisons and speaker identifications. All of these Forensic linguistic items do not only own a probative value and so don't simply offer evidence in the course of a trial, but they draw a faithful picture of the society we live in and are useful for

“[...] la comprensione di alcuni macrofenomeni come il riciclaggio o l'associazione a delinquere, o ancora sul legame tra la criminalità organizzata e la politica o l'economia [22]”.

So Forensic Linguistics has to be considered as a magnifying glass for important sociological and anthropological aspects of the modern society and it can be thought as a preventive measurement for acting against criminality and for the triumph of legality.

All of these absent [23] investigative linguistics elements that are applied to Forensic field *in praesentia* guarantee everybody's safety and freedom. However, in order to be well-exploited, Forensic Linguistics has to be practiced by highly competent experts. This is why we wrote above that a good Forensic linguist has to own interdisciplinary skills [24]. So, the Forensic Linguist *par excellence* must be well trained in: Phonetics and Phonology that are necessary for the study of the articulatory system of the sounds of human language, of the inventory of sounds of specific languages and/or dialects, of the linguistic processes that take place in the spontaneous speech; Morphology for the study of the smallest linguistic units provided with meaning and of the internal structure of words; Semantics for the study of meaning, of meaning relations among words and the phrasal meaning; Pragmatics for the study of the effective use of language during conversations and interactions; Historical Linguistics for the diachronic analysis of a language; Sociolinguistics [25] for recognizing the language used by a specific community and its variables put in relation with many parameters (e.g. age, education, religion, gender, economical and social status, etc.), Dialectology for the study of dialects, for their correct identification and for recognizing isoglosses and other dialectological elements; Dialectometry for the study of distances among dialects; Psycholinguistics for the study of the ways in which psychological and mental system rule human language; Neurolinguistics for the study of hu-

man neuronal system; Computational Linguistics or Computer Sciences for the creation of software that can help the study of language; Statistics for the objective analysis of data; Acoustic Phonetics and Signal Processing for the acoustical analysis of sounds, for filtering sound signals with noises, for indentifying anonymous speakers; and, lastly, Law in order to behave by respecting laws and legislative rules.

So, if Forensic Linguistics is inscribed within Criminalities, it means that this interdisciplinary discipline, well-known worldwide, comes to be included in a specific academic context and it means also that it comes to be accepted by a scientific community composed by scientists who can test and verify methods and who can replicate each new technique in order to apply the unquestionable principle of scientific cumulability. Not many places [26] have univocal protocols as far as concerns SR or Forensic Linguistics generally speaking, and also the assignment of SR tasks or of Forensic transcriptions to experts isn't ruled by the same principles in the world [27].

(For example, in Italy there's no methodological and functional clearness for what concerns the professional roles of experts and technical consultants. In fact, in Italy there are two registers in which people who conduct Speaker Recognition analyses and write Forensic transcriptions for the courts, can sign in: one is called "Albo dei consulenti tecnici" (en. "Register of technical consultants") and is kept in the Civil Court and the other, known as "Albo dei Periti" (en. "Register of experts"), stands in the Criminal Court. Experts or consultants who want to be enrolled in these two registers must own a «speciale competenza nella materia» (en. «A special competence in the subject»). This competence should be proved by qualifications and degrees contained in the curriculum vitae of whoever wants to become a forensic expert. Italian experts offer their professional competences to the judge when he can't formulate a univocal judgment by his own and so need someone, highly skilled, who helps him with technical evaluations intrinsic to juridical cases. So, judge's lack of technical competences puts himself in the conditions of using someone else's, in this case expert's, professional and technical competences, not verified in toto. The technical consultant, instead, is designated exclusively by one of the parties and must depend, professionally, only on it. If he does not adhere to this principle he can be accused of collusion with the adversarial party, contemporary service of legal aid or consultation in favor of adversarial parties, the assumption of legal aid or consultation to the adversarial party after having assisted one party and without the consent of the latter. Technical consultants usually take part to each phase of the expert report, since the very first issues formulated by the investigative authority to the analyses conducted by experts. He can propose deeper investigations or raise objections to the expert: his function actually coincides with the meticulous check of all the expert activities and analyses. What's more is that technical consultants aren't tied by time bounds to a given

forensic case because they can be designated also after that the expert report is fully completed) [28].

A discipline so crucial, such as FL, has to be scientifically well treated all over the world and the ways in which it is thought, considered, taught and practiced must be objective and scientific, especially for what concerns methodology. That's why, Forensic Linguistics must have specific training courses in order to train future Forensic linguists and to improve the ones who have already been practicing this interdisciplinary field of research. Furthermore, there is the need for FL to be corresponded by a specific academic field for the same aims already described for training courses *ad hoc*. Today there are many University that have not satisfied this scientific need yet and our hope is that the ones that have not instituted Forensic Linguistics as one of their main courses and as one of their more brilliant field of researches yet, will change their academic status as soon as possible.

## Conclusion

In conclusion, this paper has showed that one of the main braches of Forensic Sciences, i.e. Forensic Linguistics, has not possessed a strong and monolithic definition, on the contrary, it has been at the center of many methodological controversies throughout the years. Our study has stated the necessity of an interdisciplinary approach in order to deal with FL, as intended and requested in courtrooms today. The methodological paragraphs, concerning both the written and the oral aspect, have naturally and logically lead to the discussion concerning FL: due to the fact that it belongs first of all to Linguistics and that then it comes to be applied in Forensics and due to the other several skills needed, whoever deals with FL must own linguistic competences (such as Sociolinguistics, Dialectology, etc.) and must be interested in Physics and Computer Sciences, too. That's why our main concern has to do with education and training: the States that have not considered FL as a proper scientific discipline yet have to establish as soon as possible training courses *ad hoc* for people who want to become Forensic linguists and for scholars who want to research within this immense field of Applied Linguistics. The interdisciplinary approach proposed above is essential for FL in order to gain the scientific status that it deserves: in this way, methods described in this paper could be tested and replied if necessary by the scientific community. That's how Forensic Linguistics, intended as a scientific and interdisciplinary sphere of research, methodologically well trained and practiced and academically recognized worldwide, finally becomes a trustworthy legal instrument for guarantying everybody's safety in the society we live in.

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