

Scientific
Journal of
**Applied
Social and
Clinical
Science**

**FINGERPRINT ANALYSIS'
COLD CASES AT THE
FÉLIX PACHECO
IDENTIFICATION
INSTITUTE OF RIO DE
JANEIRO**

Stephanie Treiber

Félix Pacheco Identification Institute
General Superintendence of Scientific
Technical Police
Civil Police of the State of Rio de Janeiro (RJ),
Brazil

Tatiana Marselha Lins Garcia

Félix Pacheco Identification Institute
General Superintendence of Scientific
Technical Police
Civil Police of the State of Rio de Janeiro (RJ),
Brazil
<http://lattes.cnpq.br/7968678566891857>

Ketyúcia Fernandes Pinto Serrão

Félix Pacheco Identification Institute
General Superintendence of Scientific
Technical Police
Civil Police of the State of Rio de Janeiro (RJ),
Brazil
<http://lattes.cnpq.br/4330758878490862>

All content in this magazine is licensed under a Creative Commons Attribution License. Attribution-Non-Commercial-Non-Derivatives 4.0 International (CC BY-NC-ND 4.0).



Keywords: Fingerprint; Biometrics; AFIS; Database; Cold Cases.

INTRODUCTION

The Félix Pacheco Identification Institute (IIFP) is responsible for human identification through fingerprint analysis. The IIFP is a forensic institute, part of the General Superintendence of Technical-Scientific Police of the Civil Police of Rio de Janeiro (SEPOL-RJ). Among other duties, the IIFP has 3 forensic services that have the main purpose of determining the identity of the individual through the print analysis, they are:

- **(1) Crime Scene Analysis (SPPLC)**, responsible for carrying out fingerprints' examinations at crime scenes and on materials collected at the sites, with the aim of revealing latent prints (invisible to the naked eye);
- **(2) Fingerprint Identification of the Deceased Service (SIPN)**, responsible for identifying corpses and searching for missing people, and
- **(3) Fingerprint Identification of the Living Service (SPPV)**, responsible for identifying living people with unknown or doubtful identities, such as those indicted, in custody, loss of memory or even hospitalized.

Each service has its own protocol for capturing fingerprints that can occur through chemical or physical processes, according to the appropriate and scientifically proven methodology. After their collection or revelation, the prints become questioned pieces to be examined. They are then scanned or photographed and their minutiae are marked by the fingerprint analysis experts. The traces are then submitted to the Automated Fingerprint Identification System - AFIS (*Automated Fingerprint Identification System*). This application searches the multibiometric

database of the State Identification System of Rio de Janeiro – SEI/RJ, for fingerprints that have points converging with those of the inserted questioned pieces. The AFIS algorithms return a list of candidates for the forensic expert to analyze the matching points in order to conclude positively, or not, on the identity of the person to whom that fingerprint trace belongs. In addition to searching the State's biometric database, the questioned fingerprints can also be searched in the IIFP's physical archive.

It is important to explain that the biometric database includes the criminal and the civil one, it has all ten fingerprints collected when issuing an identity card for any individual. In the state of Rio de Janeiro, it is made up of around 24 million people. Because of that enormous database, there is a whole professional category of fingerprint analysis experts in Brazil, those specialists are very important because they solve a lot of case through fingerprint analysis since they have those big databases.

PROBLEM

A major challenge faced by the IIFP's expert services is the high number of negative results after the insertion of questioned print. Negative traces, which can also be called unsolved, are those that present a good quality, with visualization of minutiae, but, when submitted to AFIS, did not find corresponding standard biometrics in the list of candidates presented at that time. This fact occurs mainly when the print belongs to an individual who does not have an identity card issued by the State of Rio de Janeiro or who has never been subjected to a criminal identification, as these are the only databases that the IIFP has automatic access to. It is always important to highlight that there is no Brazilian national civil identification system nor an integrated system between the Union

and the States, Brazilian citizens can have an identity card in each Federation Unit. In other words, in practice, it is possible to have 27 different IDs numbers today in Brazil.

Faced with this problem, IIFP looked for different strategies to reduce the number of negative prints. It is worth noting that such unsolved cases represented almost 40% of the total crime scene service in the last 3 years, as shown in the figure below (Figure 1). The actions adopted by IIFP seek to resolve and reduce the number of unresolved traces, making them positive. To this end, a new sector was created in 2021, responsible for unsolved cases – the cold cases - accumulated over the years. Furthermore, an active search for biometrics from other databases was also initiated, which resulted in important technical cooperation agreements, with the aim of facilitating the integration of multibiometric databases from different federal and state agencies [1].

DEVELOPMENT

IIFP'S COLD CASES

In 2021, a new sector was created at IIFP with the aim of reducing the negative results that are stored in AFIS characterized as unsolved cases – the cold cases. Every time a fingerprint is inserted into this system and does not find a match, it is stored in the application's memory as an unresolved case. It may be a latent print revealed at a crime scene, a fingerprint of an unknown person, dead or alive, or even in custody, among other examples. Over time, Rio de Janeiro's AFIS system is fed by additions of new standard biometrics, for example: people obtain new copies of identity cards, new criminal identifications, cadaveric identifications in Legal Medical Institute, among other cases. These new biometric patterns are automatically entered into the system and, as

a standard AFIS processing routine, new lists of candidates can be generated for unresolved cases. To access this new analysis, a tool was developed in the system together with Detran-RJ and the *Montreal company* that provides the system of Rio's state. With this, the system itself already warns when there are new candidates for a stored trace, enabling a new forensic analysis without having to go through the entire submission process again.

Given this scenario, a sector was created at IIFP – Verification and Quality Sector – responsible for a new internal routine at the institute: carrying out forensic examinations of the “unsolved traces” at AFIS. Such action was only possible through the development of a new tool in the system that was carefully coordinated between the different organizations. The new sector was responsible for analyzing unsolved fingerprint cases that were accumulated in the system since 2015.

ACTIVE SEARCH IN OTHER BIOMETRIC DATABASES

In addition to the mentioned improvement, IIFP fingerprint experts also developed a new active search for biometrics in other databases from other federative units, in 2021. The objective was to establish a new communication routine between the different official identification institutes, in order to reduce the number of unresolved traces. With this, the IIFP would be able to access the biometrics of those who had their identity cards issued in states other than Rio de Janeiro.

The active search for biometrics in other databases began with the use of information contained in the police report (RO) and direct contact with those responsible for the investigations at the different police stations. Elements such as the accent of the criminals perceived by the victims and passed on to the investigators favored the analysis of possible identification links in other states. With

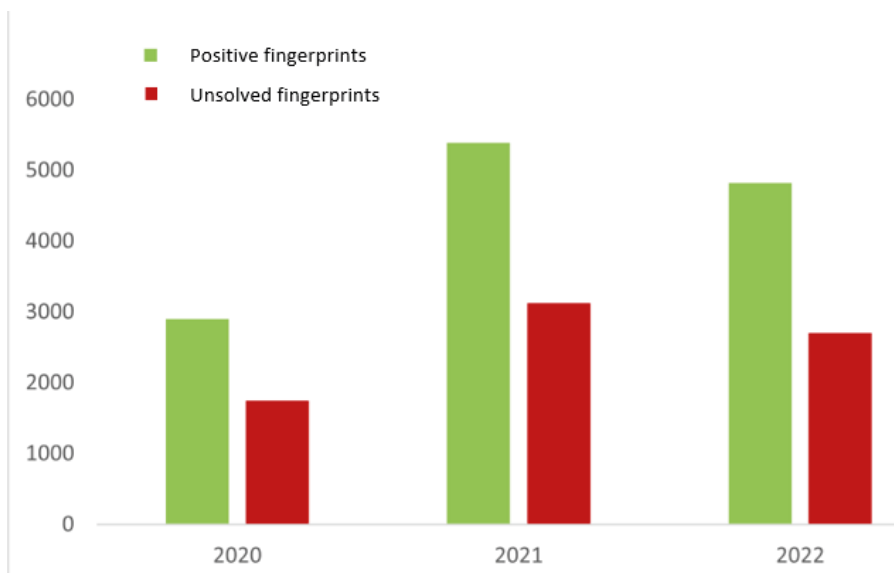


Figure 1. Latent prints collected or revealed at crime scenes by IIFP in 2020, 2021 and 2022. Comparison of the positive and unresolved traces. *Source: IIFP data.*

this, IIFP experts open a technical channel with the Identification Institutes of those states, and send the questioned biometrics. Fingerprint analysis depends on the routine of each Institute, as not all states have an electronically organized biometric database that allows direct search [1].

RESULTS

The 2 improvement actions to resolve unsolved fingerprint cases mentioned above, one internal and one external, were implemented at IIFP in 2021 and are still ongoing. The result from the internal changes in the IIFP's AFIS system had around 25% success in the expert analyzes of the new routine, until January 2022. In less than 4 months, 1260 forensic analyzes were carried out, distributed in 590 cases resulting in the positive results of 147 previously negative prints. Several cases of different criminal types were identified, such as homicides, robberies and thefts, among others. Several of these were suspended cases whose progress could be made viable given the emergence of this new forensic evidence, relevant for

investigation. There were also cases still in the criminal prosecution phase, in which the discovery of previously unknown perpetrators could change the course of these procedures. In addition to these, there were also positive cases that came from requests for identification of patients hospitalized in health units, whose identity verification became possible, and others extracted from corpse removal guides, revealing the previously unknown identity of dead people. Those kinds of results cannot be measured since they have such an enormous social and emotional relevance for the family of the deceased.

The fingerprint analysis reports produced through the new routine of this action may help to elucidate the authorship of various crimes or even reveal or confirm the identification of an unknown person, dead or alive. It is worth noting that many of these crimes are still in their statute of limitations and our forensic reports can significantly impact the conclusion of several cases, allowing the success of criminal prosecution. In Figure 2, you can see an example of a positive confrontation of one of these cases

that was unresolved in the system, with the corresponding details marked.

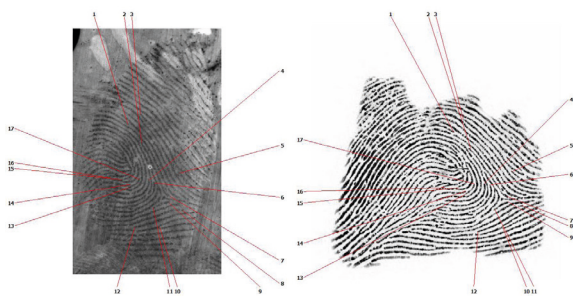


Figure 2. Positive comparison carried out at IIFP between a latent print collected at a crime scene (on the left) and a fingerprint brought by the AFIS system (on the right) with the points coinciding between them noted.

In relation to the active search in other biometric databases, the IIFP managed to positive hundreds of traces in 2021 thanks to the collaboration with other official identification institutes across the country, including: the Ricardo Gumbleton Daunt Identification Institute of São Paulo (SSP- SP/IIRGD), the Identification Institute of Pará (SSP-PA/II), the Executive Management of Civil and Criminal Identification of Paraíba (GEICC/PB) and the Federal Police Department. The success of this action involved changing work routines and procedures, improving the flow and quality of information and interinstitutional integration. The forensic reports derived from these collaborations represent fundamental technical evidence in the police investigation and helped to elucidate the authorship of several crimes such as theft and robbery, in addition to revealing an organized criminal association to commit property crimes in luxury properties [1].

DISCUSSION

Among the factors that hinder the construction of criminal information systems in Brazil, one of the main ones is the lack of standardization of means, processes and techniques. This problem results, in part, from the federal government's historical omission in relation to public security, which transferred responsibility for managing the Civil and Military police to the states. The lack of coordination of these data also resulted in the absence of a national statistical system to monitor crime and violence phenomena [2].

As a consequence of this, there is a lack of implementation of a nationally unified multibiometric database, in addition to the lack of technological tools that promote the interoperation of existing database systems and the absence of normative instruments that guide the exchange of information. Another difficulty is the hard work of migrating to the digital databases of each state in the federation. It is worth highlighting that there is still no unified database at national level and that, currently, interaction and compilation of biometric data between states is rare, whether due to lack of political interest, lack of technology, or even lack of qualified professionals in the area. There is a huge mismatch of information, waste in public spending and countless unsolved cases.

In these biases, it has become imperative for the Rio's police to establish technical cooperation agreements with other federative units and with the Ministry of Justice, through the Federal Police Department and the managers of the National Civil Identifier, which is intended as the national civil identity bank. It is with praise that the current management of Rio's civil police signed an agreement called LEAD with the São Paulo Public Security Secretariat to continue the success achieved with the active search project. The exchange of biometrics between

Rio de Janeiro and São Paulo will take place within an intranet environment and the validations will be optimized. Furthermore, this agreement will also integrate other states. Likewise, another agreement with the Federal Police has been signed, which resumes research into fingerprints at crime scenes on the federal base, enabling the eventual location of the perpetrator of the crime who has a passport, registration national immigration or criminal records in another state that has also signed an agreement with the Federal Police.

IIFP, focusing on the success of this project, obtained two terminals with access to the Superior Electoral Court (TSE) database. This electoral database is made up of the fingerprints of more than 120 million people, voters from across the country, making it one of the largest banks in the world, since voting is an obligation in Brazil. In this scope, there is an agreement being processed by the Rio de Janeiro's state which, if signed, will increase the number of research stations in the TSE base and, certainly, will result in more positive conclusive reports [1].

CONCLUSION AND FINAL CONSIDERATIONS

In 2019, the Law 13,964 – called the Anti-Crime Package – authorized the creation, in the Ministry of Justice and Public Security, of the National Multibiometric and Fingerprint Database. The main objective of this database would be to store data from biometric records, as well as fingerprints and, if possible, iris, face and voice prints. All of this would enable elements that can serve as input for criminal investigations, whether at federal, state or even district level [3].

Despite the legislative change authorizing the creation of the National Multibiometric Database, we will still have many problems to be faced in its implementation and access to this data, as according to the format described

in the current legislation, the police authority will only be able to have access to these data after judicial authorization, which undermines the effectiveness and speed of the criminal investigation. It was observed that citizens in conflict with the law are already aware of this complexity faced by the criminal prosecution system, which is why we have already noticed that criminal associations migrate from one state to another to continue their criminal practice in the certainty of perpetuating their impunity.

In February 2022, a new decree (nº10,977) was published by the federal government, establishing the National Civil Identification Registration System. According to this decree, even if the identifications are issued by a certain state of the federation, the data will be stored in a single registry, which will use a single number throughout the national territory [4]. This innovation will have significant relevance in the identification process in Brazil.

In this sense, fingerprint analysis, which is currently considered one of the most efficient forms of human identification, will become even more effective and will contribute much more to the security of Brazilian society, which will feel less threatened by these itinerant criminals who will no longer be successful with their practice. Furthermore, this single database will also help a lot in cases of unsolved identities of the living and the dead, or even missing people, being of extreme emotional and social importance for the Brazilian population.

However, it is worth noting that the creation of a National Multibiometric Database or the implementation of the National Civil Identification Registration System will not solve definitively the problems that we face. It is necessary to implement direct access to the database of these records by the Identification Institutes of all states of the federation. And we know that this process

will not keep up with the speed of our needs. Thus, we can conclude that although we have made progress in relation to the topic at the legislative level, we will still have a time gap until we can feel the practical effectiveness of these measures, which is why the technical cooperation agreements made and the other

actions implemented must be maintained, and State and federal Public Security organizations must continue with reciprocal assistance, making the values inherent to our cooperative federalism increasingly attainable, where Public Security is a duty of the State, a right and a responsibility of all [5].

REFERENCES

- [1] S. Treiber; AT Motta; TML Garcia. Active search in Biometric Databases at the Félix Pacheco Identification Institute. *Public Security Notebooks* - Year 13: Number 13 (2021) - Retrieved in December 2021 from, <http://www.isprevista.rj.gov.br/>.
- [2] R.S. Lima; S.O. Bueno. The black hole of public security information in Brazil. *GI*. Rio de Janeiro. (2018) - Retrieved in November 2021 from, <https://g1.globo.com/monitor-da-violencia/noticia/o-buraco-negro-da-informacao-em-seguranca-publica-no-brasil.ghtml> /.
- [3] Wilson L. Palermo Ferreira. *Legal Medicine: Synopses for competitions* – Volume 41. 6th ed. Juspodivm Publisher. Brazil (2021) 127-131.
- [4] BRAZIL. Decree No. 10,977, of February 23, 2022. Regulates Law No. 7,116, of August 29, 1983, to establish the procedures and requirements for the issuance of the Identity Card by identification bodies of the States and the Federal District, and Law No. 9,454, of April 7, 1997, to establish the Citizen Identification Service as the National Civil Identification Registration System. Retrieved in March 2022 from http://www.planalto.gov.br/ccivil_03/_ato2019-2022/2022/decreto/D10977.htm
- [5] S. Treiber, TML Garcia, KFP Serrão. “Cold Cases” of Papilloscopy: unresolved traces at the Félix Pacheco Identification Institute – IIFP. *Brazilian Journal of Criminalistics* – Vol. 12, number 3 – 2023. Proceedings of the XXVI National Congress of Criminalistics (CNC2022). Available at: <https://revista.rbc.org.br/index.php/rbc/article/view/749/364>