TECHNICAL NOTE

Carlo Torre,[1] *M.D. and Giacomo Giacobini,*[2] *M.D.*

A Simple Method for Studying the Surface of Fired Bullets: Varnishes for Replicas

REFERENCE: Torre, C. and Giacobini, G., **"A Simple Method for Studying the Surface of Fired Bullets: Varnishes for Replicas,"** *Journal of Forensic Sciences*, JFSCA, Vol. 29, No. 3, July 1984, pp. 915–918.

ABSTRACT: The authors describe a new, simple, and rapid method for studying the surface of fired bullets. They employ a transparent varnish (Vernis Réplic) that can be observed under a light microscope or mounted on normal slide frames and directly projected.

KEYWORDS: criminalistics, ballistics, reproductions

Various techniques have been used to obtain replicas of the lateral surfaces of fired bullets. These techniques use materials that can be opened on a plane after the replica is made. The replica can then be compared to casts or replicas made from other bullets. Georgiadès [*1*] and Balthazard [*2*] obtained replicas by rolling or applying carbon paper, gutta-percha, or tinfoil. More recently Bohne [*3,4*] has used collodion films. These techniques all produce replicas that can be examined microscopically. However, the fine detail within the rifling impressions is generally poorly reproduced.

In the field of metallography there exist special varnishes that can be applied to metallic surfaces and subsequently removed, obtaining a thin, transparent, and resistant film, which reproduces with extreme precision the morphological characteristics of the surface. These films are easy to handle and can be observed at all levels of magnification (with light or scanning electron microscope) even after coloring or shading.

To obtain replicas of bullets, we used Vernis Réplic produced by Presi (2 avenue Hector Berlioz, 38320 Eybens, France). This varnish is a nitrocellulose compound, with the addition of a solvent and a plasticizer.

The varnish is applied to the bullet by simple immersion; about 2 h later the varnish is dry and can be removed with the help of a pair of tweezers, starting from a longitudinal incision made with a razor blade. Immersion prior to varnishing in a solution containing 0.50% vaseline in benzene can help the removal; this can be further facilitated by dipping the varnished bullet in water (or in a solution of detergent and water).

Received for publication 2 Aug. 1983; revised manuscript received 5 Dec. 1983; accepted for publication 9 Dec. 1983.

[1] Associate professor, Department of Forensic Medicine, University of Turin, Turin, Italy.
[2] Professor, Department of Human Anatomy, University of Turin, Turin, Italy.

The figures represent replicas observed under a light microscope. The replicas have been mounted on normal slide frames.

Figure 1 shows four examples of complete replicas obtained from copper-jacketed 7.65-mm bullets (the entire lateral surface of the two bullets is represented) fired by pistols with different grades of wear of the bore.

Figure 2 shows, at higher magnification, the fine details that can be observed, with this method, using an ordinary light microscope; the lateral surface of a jacketed bullet 9-mm Luger shows grooves and marks, as well as thin superimposed scratches, variously directed, caused by manipulation after firing.

Figure 3 shows the correspondence between marks in close-ups of replicas obtained from the lateral surface of two different bullets (*a* and *b*) fired by the same weapon (semiautomatic Beretta pistol Model 34, 7.65 mm) (macrophotograph). The limit between the two replicas is indicated by a black horizontal line. The choice of details to be compared is suggested by a preliminary comparison of the different replicas, projected in toto like normal slides. Subsequently a normal micrography can be made.

Figure 4 shows another detail of the same group of bullets (light microscope photograph).

In conclusion, the proposed method seems interesting for the following reasons:

1. The technique is readily and easily carried out, and it has very low costs.
2. The equipment needed is very simple and it is part of the standard equipment of every laboratory; the examination of the replicas can be carried out with direct macrophotograph, without using a light microscope.
3. It is possible and advisable, for a first comparison, to project the replicas like slides and

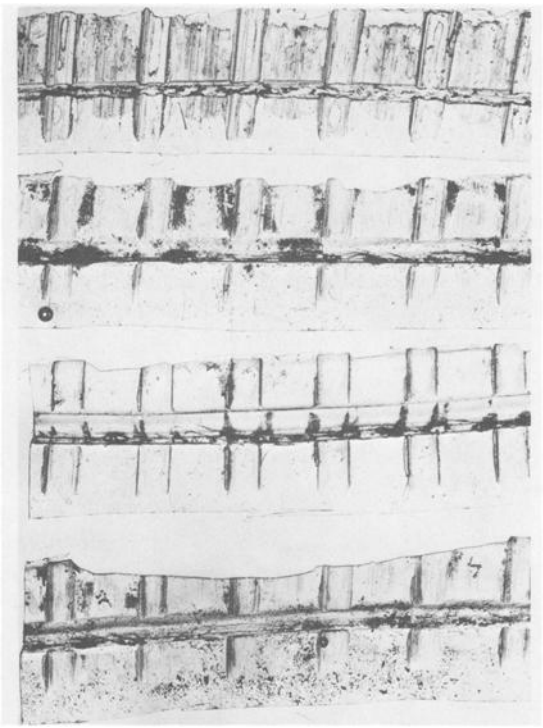

FIG. 1—*Four complete replicas obtained from copper-jacketed 7.65-mm bullets fired by pistols with different grades of wear of the bore.*

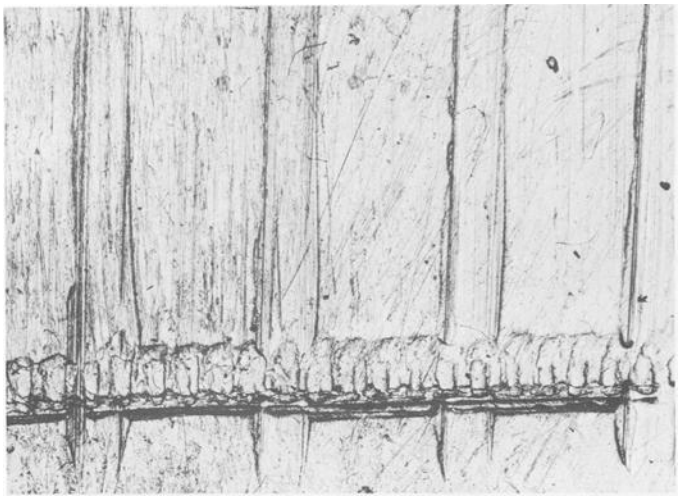

FIG. 2—*The lateral surface of a jacketed bullet 9-mm Luger shows grooves and marks, as well as thin superimposed scratches, variously directed, caused by manipulation after firing.*

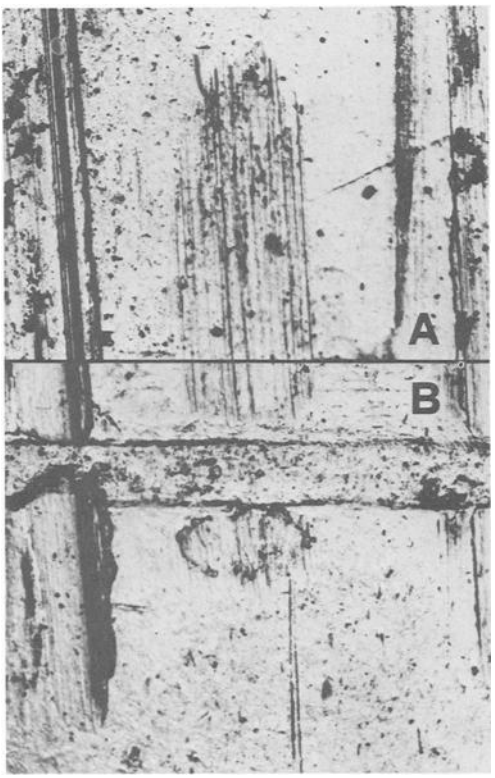

FIG. 3—*The correspondence between marks in close-ups of replicas obtained from the lateral surface of two different bullets* (a) *and* (b) *fired by the same weapon (semiautomatic Beretta pistol Model 34, 7.65 mm) (macrophotograph).*

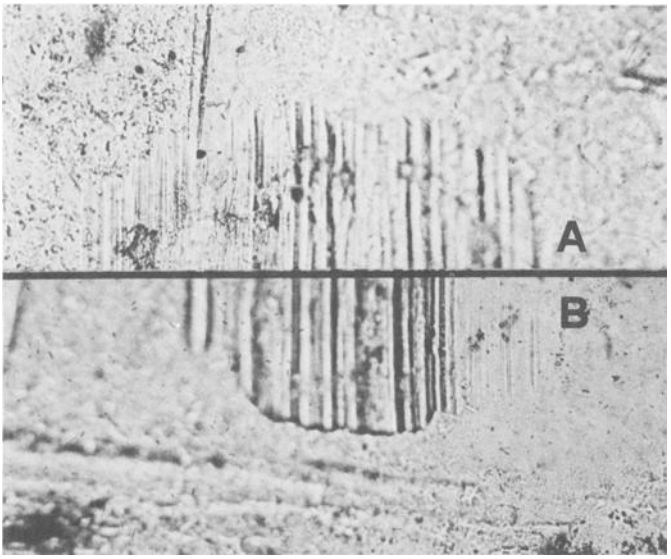

FIG. 4—*Another detail of the same bullets in Fig. 3 (light microscope photograph).*

to point out, on the screen, any coarse homologies, selecting then the details to be documented with greater precision on the photograph.

4. Images at all levels of magnification and free from distortion can be obtained, including a complete view of the lateral surface of the bullet and single details, both with the light and with the scanning electron microscope.

5. It is possible to make replicas of details of big objects, too voluminous to be introduced into the chamber of normal scanning microscopes, thus obtaining images at high magnification even with materials of other than firearms evidence.

Acknowledgments

The authors are indebted to Dr. P. F. Puech (Nimes, France) for helpful suggestions concerning the use of the varnish for replicas.

References

[*1*] Georgiades, P., "Une nouvelle méthode pour déterminer l'identité des projectiles," *Annales de Médecine Légale*, Vol. 2, 1922, p. 30.

[*2*] Balthazard, V., "Identification des projectiles; perfectionnement de la technique," *Annales de Médecine Légale*, Vol. 2, 1922, p. 345.

[*3*] Bohne, G., "Ein neues Verfahren zur Identifizierung abgeschossener Kugelin," *Archiv fuer Kriminologie*, Vol. 101, 1937, p. 111.

[*4*] Bohne, G., "Die Fixierung von Schartenspuren mittels Kollodium-häutchen und das Photographieren der Innenwand eines Rohres kleisten Kalibers," *Archiv fuer Kriminologie*, Vol. 119, 1957.

Address requests for reprints or additional information to
Prof. Carlo Torre
Instituto di Scienze Medico Forum
Universita di Torino
C.so Galileo Galilei 22
10126 Torino, Italy