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## **Ballistic Fingerprinting**

The gun prohibitionists have been using the recent serious of murders in the Washington, DC area as an argument for what they call “ballistic fingerprinting.” What is this? Can it work?

As just about anyone who has ever watched television cop shows knows, the rifling on the inside of a gun barrel leaves a distinctive set of marks on a bullet which can be matched up to a particular gun. Less well known is that cartridge cases also acquire somewhat distinctive firing pin, extractor, and ejector marks. For a number of years, gun control advocates have been arguing that if we did “ballistic fingerprinting” of guns, we could solve a great many crimes.

The argument goes that when police recovered a bullet from a crime scene, they would just photograph the marks, run it through a national database of such “ballistic fingerprints,” and in no time at all—presto! The police have the name of the owner of the gun, and so they go out and arrest him. New York State and Maryland have recently passed laws requiring handguns being sold in those states to be ballistically fingerprinted.

So...what’s wrong with this? Yes, most gun owners get pretty uncomfortable with mandatory gun registration, and let’s face it, to be of any value, ballistic registration would have to include the gun owner’s name as well, or it wouldn’t help much. But wouldn’t it do so much good for solving crimes that gun owners should just accept it?

1. Anyone who is arguing that we should pass a law because of this series of cowardly murders near Washington isn’t making much sense. Incidents like this are actually pretty rare. According to the FBI’s *Crime in the United States 2000*, out of about 13,000 murders for which the FBI was able to get detailed information, only eight have

circumstances listed as "sniper-type"—and only one of those was with a rifle.<sup>1</sup> There are probably additional “sniper-type” murders that are lumped together under the "other" category, or for which the FBI didn't receive any detailed information. Nonetheless, it is very hard to believe that we are talking about hundreds of sniper attacks a year. I would be surprised if there are more than a dozen to a few dozen in the whole country per year. I would also guess that many of these were done by careful and methodical paid assassins, who aren't likely to be using a gun that can be traced at all.

2. This comparison of rifling marks to fingerprints is pretty misleading. To quote from a standard work on forensic science: “A rifled weapon's characteristics are not so immutable as a man's fingerprint. Although it has been demonstrated that the first and the thousandth of successive rounds fired through a clean weapon in good condition can be matched, weapons to be examined are not always clean and free from rust. [M]ore frequently, if the crime bullet has struck anything hard, it may be too distorted for any comparison to be made. Lastly, if the gun barrel is very old and worn and if the bullet has a very hard jacket, the marks may be too indefinite for a definite conclusion to be reached.”<sup>2</sup>

Indeed, this has been the case with these shootings in the Washington area. News coverage has made this point: “Jim Kouri, vice president of the National Association of Chiefs of Police, said that the .223 caliber bullet tends to break up more than other bullets upon impact, a challenge for ballistics examiners. ‘It is very very difficult to make comparisons when you get a fractured or shattered round,’ Kouri said.”<sup>3</sup>

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<sup>1</sup> FBI, *Crime in the United States 2000*, 22.

<sup>2</sup> H. J. Wells, *Forensic Science*, (New York: Praeger Press, 1974), 201.

<sup>3</sup> Jeannine Aversa, “Sniper's Gun Remains a Mystery,” Associated Press, October 23, 2002.

3. Even normal use of a gun will change its rifling marks over time. What about intentional alteration? A file applied to the muzzle end, or a reamer passed through the barrel can alter the rifling as well. Will it change enough to prevent a firearms examiner from identifying it as the gun that fired a fatal bullet? I'm not sure, but at least some experts think it is possible. Admittedly, criminals don't do that sort of thing now. I'm sure that before human fingerprinting was developed a hundred years ago, burglars didn't ever wear gloves, either.

For some handguns, changing the barrel is a bit of work, and for some rifles, it's beyond the ability of the average hoodlum. But for many handguns, it isn't that much effort to change the rifling marks—you just replace the barrel when you clean the gun. Replacement barrels aren't serial numbered or tracked. Ballistic registration, to be really effective, is going to require some changes to the laws about replacement barrels.

The really stupid criminals aren't going to put this much effort out, of course. But I don't think the really stupid criminals are that hard to catch right now. It's the smart ones that are harder to catch.

4. Ballistic registration only works if the person criminally misusing the gun is the registered owner. While I'm sure that occasionally criminals register their guns—and occasionally people who were law-abiding gun owners become criminals—it's a pretty good bet that these aren't going to be common cases. The guy who robs banks or liquor stores, or who sells crack for a living, almost certainly didn't get his gun in a lawful way. If he steals a gun, or buys a stolen gun, ballistic registration only tells the police who the gun was stolen from—not who has the gun now. People who commit murder are overwhelmingly minors, or people with previous felony convictions—so they can't

lawfully own a gun at all. They aren't going to register it—and this whole scheme then fails.

5. Ballistic registration is surprisingly expensive, much more so than simply registering gun serial numbers. The police would have to do ballistic registration at a facility with a forensics bullet trap. Not all police departments have this equipment, especially in smaller towns. Someone familiar with the equipment would have to fire and recover the bullet. It seems unlikely that the police could do such ballistic registration in less than 15 minutes per gun, including filling out forms, firing the gun, and photographing the rifling marks under a microscope. (We won't even consider what will happen if the courts decided that the police must preserve the bullets themselves to prove that the photographs of the rifling are accurate.)

If the roughly 100 million handguns and rifles were subject to this requirement, at least 25 million man-hours (15 minutes per gun) would be required nationally to do an initial ballistic registration. Since there are 2,080 working hours in a year, that means more than 12,000 police employees in the United States would be doing *nothing* but ballistic registration for a whole year. There were 926,583 full-time police employees in the United States in 2000 (both sworn officers and civilian employees).<sup>4</sup> More than 1% of law enforcement agency personnel in the United States would be doing *nothing* but ballistic registration for a year.

To keep such records up to date, because of the problem of rifling changes caused by wear, existing guns would have to be test fired again. Even if we only did this every

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<sup>4</sup> FBI, *Crime in the United States 2000*, 291.

two years, more than 6000 police employees in the U.S. would be working full-time just to keep the ballistic registration records up to date.

6. Probably the most devastating problem with ballistic registration comes from a recent technical report produced by the California Department of Justice (and suppressed as soon as the California Attorney-General saw it). The report examined the problems of building a database of ejected pistol cartridge cases, and using them to locate a gun used in a crime. Now, cartridge case markings are a bit different of a situation from bullet markings, but not dramatically different. This report quite pointedly showed that the problems of rifling marks and cartridge marks were only different in scale, not in kind.

The report observes that as the number of cases from different guns increases (and the vast majority are of the same caliber, and many from the same make and model of gun), the usefulness of the database declines, because the similarities between cases swamp the differences. If you have fifteen guns, you can identify that a bullet almost certainly came from one gun out of the bunch—or that it didn't come from *any* of the guns in this bunch. If you have markings from 100,000 guns, and 30,000 of them are the same make and model, this becomes a statistical nightmare.<sup>5</sup>

At this point, some of you are scratching your heads. (Okay, *you* aren't, but another, less intelligent and less good-looking reader of this column is scratching his head in confusion.) Why? Okay, this is a statistical problem, and perhaps the easiest way to explain is by analogy. Imagine that automobiles didn't have license plates (which are easy to remove) or Vehicle Identification Numbers (which are a bit harder to remove).

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<sup>5</sup> Frederic A. Tulleners, "Technical Evaluation: Feasibility of a Ballistics Imaging Database for All New Handgun Sales," (Sacramento: California Department of Justice, 2001), available at [http://www.nssf.org/PDF/CA\\_study.pdf](http://www.nssf.org/PDF/CA_study.pdf).

Someone has stolen your 2001 Chevrolet Malibu. You suspect that a particular used car dealer is selling stolen cars, so you go to the lot and try to find your stolen Malibu. You know something about it: it's a 2001; it's white; it's the LS model; there's a small paint chip just inside the driver's door. That sounds pretty distinctive, doesn't it? Most of those details you can tell almost immediately—though you'll have to open the driver's door to check for that paint chip.

Let's say that there are ten cars on that dealer lot who you suspect may have your stolen car. Is it there? The odds are that while there might be two or three Chevrolets on the lot, it's not likely that more than one of them is a Malibu. Even if two or three of them are Malibus, it is unlikely that more than one of them is a white 2001 (like yours).

It's a pretty quick operation to look over those ten cars, and immediately tell that nine of the ten can't be your stolen Malibu. The tenth one is a Chevrolet Malibu, and it might be yours, so you'll have to check the year, color, model, and options. If those match, you look for the paint chip inside the driver's door, just to be sure. In about three minutes, you can say for sure if your car is there or not.

This is roughly what happens when a firearms examiner compares a gun retrieved from a criminal's house, and checks to see if the rifling matches the bullet found in a dead body. The firearms examiner is comparing that bullet against a small number of guns that *might* have been criminally misused. It takes him a few minutes, because he doesn't have thousands of gun barrels to check.

Now, increase the number of cars on the lot to 1000. There might be 100 Malibus on the lot, but you will need to walk through the lot, looking for them, to see if it is right year, color, model, and options. It is very likely at least twenty of the Malibus will be

exactly your year, model, color, and options. You now have to open the driver's door on all twenty of those 2001 white Malibu LSs to look for the paint chip inside. If you did this by hand (walking through the whole lot), it would take you quite a while.

If you use the car dealer's computer to look through his list of cars, you can save a lot of time by saying, "Let's get a list of the 2001 Chevrolet Malibus on the lot. That way we don't have to walk around the whole lot looking for them." You've turned an operation of many hours into perhaps ten minutes.

Using the dealer's computer to narrow down the list of cars to check is equivalent to using a computer to search a ballistics database for matching rifling marks. A firearms examiner still needs to compare the bullet from the victim with the rifling marks from a number of guns to be sure that this bullet exactly matches that gun, but now he is back to checking just a few guns, not thousands.

Now, increase the number of cars on the dealer's lot to 100,000—which is about the number of new handguns sold in California every year. You will certainly have *thousands* of cars that are white, 2001 Chevrolet Malibu LSs. If you try to check every single one of them for that paint chip on the inside of the driver's door, you will be busy for many days; there isn't time to check all of them. So, you need to "weed out" the cars that probably aren't the one that you are looking for.

How will you do that? Some of these white, 2001 Chevrolet Malibu LSs will be about the same mileage as your stolen Malibu. Some will be badly dented; some will be in good condition, just like yours was when it was stolen. You refine your database so that you only check the likely matches. The computer gives you a list of the top 40 matches, and you go check those. But your stolen Malibu might be number 129 for

likelihood of match—so suddenly it's less likely that you find the Malibu you want in this enormous sea of cars. (To make this analogy fit the altered rifling marks analogy a bit better—perhaps whoever stole your car painted it a different color, or it is a lot more dented than when it was stolen.)

Now, increase the number of cars on the dealer lot to one million—or increase the number of ballistic registrations to one million—and you have a nearly useless database. Ballistic markings are not anywhere near as unique as fingerprints. So many of the guns will be nearly identical, and produce nearly identical marks on the bullets, that the particular gun that you want to find, is unlikely to be in the top 50, or 100, or 500 matches. The government *can't afford* to have firearms examiners check 1000 matches on a regular basis, even for a crime as serious as murder.

7. It's not clear how much of a difference ballistic registration will make in solving crimes. In 2000, the police identified who the killer was in 63.1% of murders<sup>6</sup> even without ballistic registration. Remember that the only crimes that ballistic registration has even a chance of solving are those committed with handguns and rifles. That's about 56% of murders. Even if ballistic registration worked *perfectly* (which even gun control advocates aren't foolish enough to claim), it won't do a bit of good for the 44% of murders committed with shotguns, knives, clubs, feet, and fists.<sup>7</sup>

8. Shotguns have no rifling marks. Ballistic registration creates an incentive for criminals to switch from handguns to sawed-off shotguns. Believe me, if someone is going to try and rob me on a dark city street, I would much rather have them use the cheapest and crummiest .32 revolver, instead of a sawed-off shotgun.

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<sup>6</sup> FBI, *Crime in the United States 2000*, 18.



Ballistic registration is just gun registration with a high-tech promise to it, a large price tag, and a lot of promises. For all this money and time, can't we do something a bit more intelligent? Like keeping better track of the convicted felons that commit almost half the murders in the United States?

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<sup>7</sup> FBI, *Crime in the United States 2000*, 19.