

Leonardo da Vinci, one of the greatest painters of all time, also contributed to society something far more valuable than the Mona Lisa—the first self-igniting firearm.

by DAVE KOPEL, PAUL GALLANT & JOANNE D. EISEN

WHY IS THIS WOMAN SMILING?

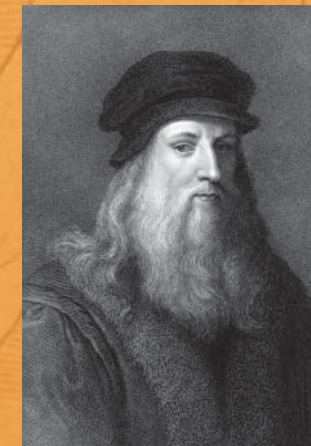
HE WAS ONE OF THE TOP TEN geniuses in the history of the human race. He was one of the greatest artists of all time. He painted the enigmatic Mona Lisa. Just maybe the girl in the painting is smiling because she's carrying a concealed handgun designed by her painter. »»»»» The painter was Leonardo da Vinci (1452-1519), and he was one of us.

Leonardo gave us the wheellock, which was the first self-igniting firearm.

Before da Vinci invented the wheellock, most firearms were matchlocks. The fuse in the matchlock was a slow match or a piece of rope-like material, soaked in saltpeter and then dried. The fuse needed to be ignited shortly before use. The fuse then would be lowered into the flash pan to ignite the propelling charge of powder.

Although the ignition system was adequate for soldiers firing a prepared volley, a matchlock could not be used for personal defense against a sudden attack, and it was highly vulnerable to weather conditions. With a wheellock, sparks could be generated in any weather, and the gun's priming pan was covered until the instant the gun was fired. Da Vinci's superior wheellock firearm ignition system made the matchlock obsolete and was used for about two centuries.

The mechanism of the wheellock is analogous to a modern cigarette lighter, composed of a serrated metal wheel linked to a powerful, tightly wound spring. The wheellock ignition device is situated at the rear of the barrel. When the wheel is fully wound and the user presses



the trigger, the spring is released. As the wheel begins to spin, it scrapes against stones of iron pyrite or flint, generating sparks, and the sparks ignite gunpowder inside the powder pan.

Eventually the wheellock was superseded by the flintlock; wheellock production costs were high because the mechanism was complex, requiring a skilled gunsmith. The mechanism was difficult to clean and to maintain in good working fashion, and too often broke or jammed.

For centuries scholars have argued over whether da Vinci really invented the wheellock, because most early wheellocks date from Germany in the 1500s, and

da Vinci was Italian. However, Vernard Foley, a professor of history at Purdue University specializing in the history of science and technology, has carefully examined da Vinci's drawings and put the matter to rest.

Writing in the January 1998 issue of *Scientific American*, Foley explained: "It appears that da Vinci utilized components from other machines that he had worked on in the 1480s and 1490s—such as door locks and bicycles—and put them together in a fundamentally new way to

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create the wheellock.” The reason the wheellock was found in German guns, concluded Foley, was that da Vinci had a young German assistant named Giulio Tedesco, who worked with him for a few years. Tedesco returned to Germany, probably no later than 1500, but da Vinci had been working on the wheellock around 1493.

Da Vinci was a prolific and ingenious weapons designer.

permitted to cool between firing, and one would be re-loaded. His method of constructing gun barrels using wrought-iron coils anticipated the design of Sir William George Armstrong’s gun barrels of 1855.

Rapid-firing guns—such as the Gatling gun and early machine guns—did not come into common use until the 19th century, but da Vinci foresaw the problem of rapidly-created heat destroying

breech-loading weapons. He also gave detailed instructions for constructing “an airgun which shoots with marvelous force.”

Da Vinci was keenly interested in the trajectory of missiles and the as yet unknown science of ballistics. He posed many theoretical questions: “If with four pounds of powder a bombard hurls a ball of 4 pounds two miles how far will six pounds of powder hurl it? ... If the bombard can throw two or three balls with ease I ask whether it is better to make the ball long or no If the bombard rests on the ground or on a stump, or straw or feathers, what difference will there be in the recoil?” He noted: “Of balls of equal weight that which is the swifter will seem heavier and will produce a greater percussion.”

Da Vinci was the illegitimate son of Ser Piero di Antonio—an up-and-coming Florentine official—and a woman named Caterina, about whom history has left few details.

Raised by his mother, and showing early signs of artistic genius, he became an apprentice at age 15 to one of the leading artists of the day, Andrea del Verrocchio. His experience in Verrocchio’s studio in Florence enabled him to join the painters’ Guild of St. Luke in 1472.

Surprisingly, some modern pacifists claim that the prolific weapons inventor, da Vinci, was one of them. They point to his statement “it is an infinitely atrocious act to take away the life of man,” and to his description of war as “bestly madness” (*pazzia bestialissima*).

But recognizing the horrors of war is not the same as abjuring the just use of defensive weapons. “I have come to hate war,” said Dwight D. Eisenhower, the supreme commander of the Allied forces in Europe during the Second World War. President Eisenhower, an NRA Life member, was certainly no pacifist. (Eisenhower was also an avid skeet shooter. His

Winchester Model 21—with a special carrying case that looks like a golf bag—is in the NRA’s National Firearms Museum.)

Like Eisenhower, Leonardo da Vinci valued freedom: “When besieged by ambitious tyrants I find a means of offence and defence in order to preserve the chief gift of nature, which is liberty ...” (*Notebooks*, p. 284).

In his letter to Ludovico il Moro, Duke of Milan, requesting employment, da Vinci emphasized his ideas for creating “instruments of war,” bragging “I shall contrive various and endless means of attack and defence.” His plans included machines capable of “destroying every fortress or other stronghold even if it were founded on rock.” They included armoured vehicles, cannon, mortars, catapults and devices that would increase the firepower and rate of fire for all kinds of missiles.

Milan had long been a strategic commercial center, a plum to anyone who controlled it, including the Carthaginians, Romans, French, Spanish, Austrians and Germans. It was sacked and rebuilt five times. DaVinci was hired by Ludovico, helping the Milanese retain their independence.

In 1495, the 70 tons of bronze that had been collected for the statue of Ludovico’s father was melted down into weapons to help save Milan. But in 1499, the French conquered Milan, in part because Ludovico had alienated much of the population by excessive taxation.

After 1502, da Vinci worked for Cesare Borgia in Florence, during a war with Pisa. The people of Pisa, who were treated as serfs by the Florentines, were in frequent rebellion against them. Biographer Serge Bramley noted that da Vinci “concentrated his efforts on finding an intelligent, humane, peaceful and lasting solution to the conflict.”

DaVinci’s proposal was to cut a canal from Florence to the sea. The canal and seaport access would enrich Florence, and eliminate Florence’s economic dependence on Pisa. As a result, Florence would no longer perceive a need to oppress the Pisans. But the canal was an enormous undertaking involving locks, pumps and siphons. Borgia rejected the canal plan.

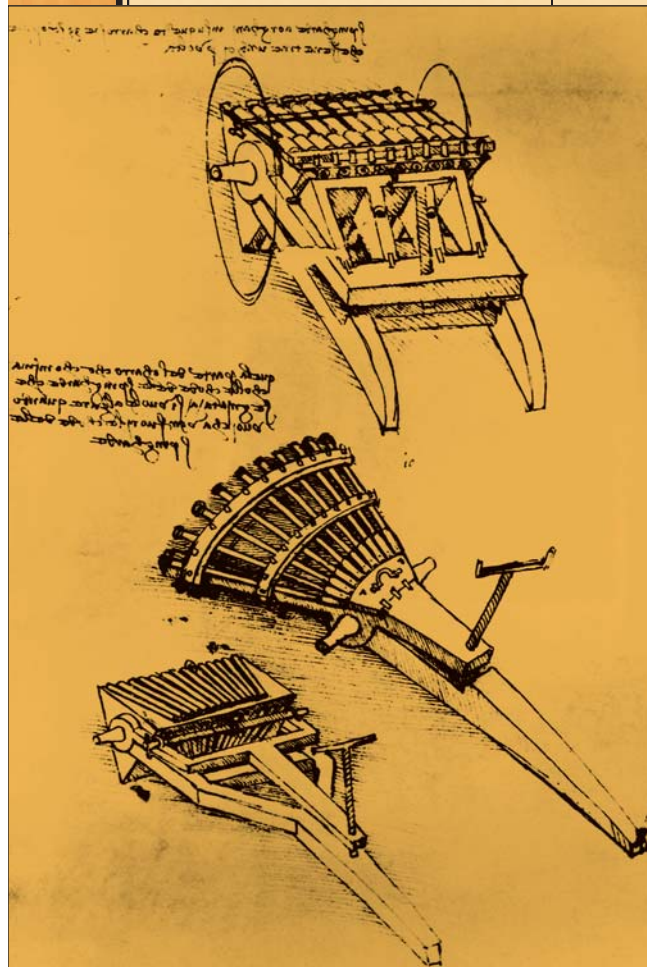
While the war with Pisa raged, da Vinci was commissioned to paint a patriotic fresco—the *Battle of Anghiari*, depicting the 1440 battle between Florence and Milan. The project consumed three years. Although the original painting no longer exists, sketches and partial copies remain, and they graphically illustrate the horrors of war.

Da Vinci kept a series of highly technical journals, accompanied by copious notes and drawings of inventions. It is from those journals, published in English as *The Notebooks of Leonardo da Vinci* by Oxford University Press, that da Vinci explained his philosophy of defensive arms.

“Swords and spears ... themselves never do harm to anyone,” he wrote. The fault lay in the person who misused a weapon, “that which of itself is gentle and void of all offence will become terrible and fierce by reason of evil companionship, and will take the lives of many people with the utmost cruelty ...”

DaVinci also understood the principle of armed deterrence: “... it [evil companionship] would slay many more if it were not that these [gentle victims] are protected ... [by weapons] of iron.” (*Notebooks*, p. 252)

To create defensive arms used to save gentle victims is the noble calling of America’s modern gun makers and gun designers, as they follow in the footsteps of supremely talented—and humane—Leonardo da Vinci. ☛



LEONARDO DA VINCI, PROLIFIC WEAPONS DESIGNER:

“... he designed a triple-tier machine gun with eleven barrels per tier. One tier would be fired, one would be permitted to cool between firing, and one would be re-loaded.”

Although the wheellock was an eminently practical and very major improvement in firearms technology, some of his other designs were far ahead of their time. For example, he designed a triple-tier machine gun with eleven barrels per tier. One tier would be fired, one would be

the barrels. So he diagramed how to make water-cooled gun barrels. Water-cooling was in fact used for some of the 19th century guns.

He also drew diagrams of rudimentary exploding projectiles designed to be fired from a catapult, and he showed great interest in