Pietra del fuoco

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Le Pietre del Fuoco
Flintstones - Stones of Fire

Veronese Flintstones and the Flints of Europe

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Inside Front Cover:

The preparation of the educational exhibit was entrusted to the Cooperative "Archaeology and Territory", with personal contributions by:

George Chelidonio: general research, technology, coordination and texts.
Bruno Avesani and Fernando Zanini: ethnographic documentation.
Lorenzo Brunetto: experimental technology.
Antonio Mellini: historical traditions (ritual and "magic").
Roberto Partesotti: environmental reconstruction and exhibit consulting.
Alberto Solinas: history of research and maps.
Henry Tettamanti: chronology of firearms.
Dario Zampieri: geology of flint.
Paul Mel: Documentation - Venice.
Gabriele Nenzioni: Documentation - Bologna .

Particular contributions of documentation and materials were furnished by:

Dr. Franco Finotti - Civic Museum of Rovereto
Dr. Alberto Edge - Ca Viviani 36040 Sarego (VI)
Mr. Giuseppe di Salvatore - Via del Mutilati 4/B 37100 Verona
Dr. Luciano Salzani - Archaeological Superintendent of the Veneto-Verona - Str. S. Fermo, 3
Bartolo Fracaroli - Verona
Dr. Alberto Cosulich - Museum of Wine and VitaAgriculture (Susegana- TV)
Davide Pedersoli Armi snc - Gardone Valtrompia (BS)
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- "Italy in the Stone Age", Bruno Brizzi, 1977, Ed. Quasar, Rome
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- "Heron" n. 37/ 1984 e n. spec. 1/ 1987, .Ed: George Mondadori
- "Weekend", suppl. n. 48/1980, Milan

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Exhibit Visit Schedule:
Weekdays and holidays 9-12/ 15-19 (excluding Monday).
Free entry.

Forward:

For at least 12,000 years, but perhaps for many more millennia, flintstones (pietre focaie) have been inseparable from the daily lives of humans. On the European continent, pyrite, marcasite, quarzt, flints and other stones sufficiently hard for the purpose are found. Each culture developed a precise use, based on the properties of the native rock or that acquired through commerce.

But History often ignores the small tools and the habits of daily life, that are instead sustained and developed in the tradition of oral "histories".

From the memory of the people and from the piles of "folende" (flint) chips made from regularly cut flint stones found in the paths, and among the regions of Lessinia, this exhibit tries to weave the threads of research, in an incredible tangle of names and functions, to formulate a correct dimension to a European industry that perhaps for more than 2 centuries (1700-1800) prepared calceous stones for domestic use or for rifles, in many parts of northern Italy.

And if the Danish, French and English flintstones have been so influential as to heighten the encounter/clash of different cultures in North America, the industry of the Verona "flints" is certainly not marginal, for quality, for number, or for the area of commercial diffusion.

The presence of Veneto "flints" in Tirol, in the Bolognese Appennini, in the Venetian Lagoon and even, perhaps, in Denmark, underlines its importance, and still the extreme limits of its distribution are yet to be known. This comprehensive exhibit not only intends to familiarize but also to promote further research.
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Cutting shelter (Stallavena-VR) "Stone Workshop", an area inhabited by the flint cutters. Culture "Epigravettiane", about 12,000 b.c.

"Folende": Flintstones of Veronese Lessinia, Abundant, Mysterious and Sought After

Folende were perhaps much more frequent only twenty years ago. Along the paths and roads of Lessinia, the highland prealpine Veronese, one meets people who habitually report on flint - unrefined rock, prehistoric artifacts, or flintstone of an historical era - with the term "folenda", or better, the plural "de folende".

It was evident that the culture of Lessinia had developed accomplished facility with this hard and sharp material, so abundant only in the middle and high ridges and in their valleys, but the evidence does not describe its distribution or its precise uses, not for location nor in time.

For a small group of students and researchers of Veronese prehistory the "folende" is certainly not unknown, frequently the subject of interest, discussions and even popular "misunderstandings".

The principal problem of the discussion is whether the "folende", all or in part, were manufactured in prehistoric times. On one hand, the numerous places characterized by the abundant remains of "folende" suggest an historical answer to the researchers; on the other, their frequent poisitioning nearby when not on the same prehistoric sites (as at "Cutting Shelters" or situated in the paleolithic "Palace of Palui" (Ca Palui)), complicates the answer to no small degree.

1.2.3: "Strange Flints" made in Breonio (VR) at the end of the 1800's.
4: PaloeIndian amulet in flint made in the form of a turtle (Nevada, about 500 AD).
5-6: Serrated Arrow Points (perhaps for fishing). About 4000 BC. Egyptian Neolithic.

Cultures different and distant among them in time and location have realized forms, functional or symbolic, "strange" to our eyes.

Yet we could say that the debate on the "folende" started in the same years as the prehistoric research in Lessinia: in 1885 at a session of the Berlin Society of Ethnology, professor Wirchow presented some manufactured stone articles: "acquired from a Balzano merchant, who dealt them for use in firearms".

Paleoethnologist Paolo Orsi (Civic Museum of Rovereto) and Stefano de' Stefani, then inspector for the Monuments of Verona, took an interest in the communication. The relationship was precise and documented:

"The Veronese locations selected historically for the industry of the flints for firearms, were the countries of Cerro in the District of Verona, and San Mauro di Saline in Tregnago. There are still mounds of splinters and remains accumulated from years and years. In the year 1851 De'Stefani sent to Lodi to the Firm Luigi Cavezzali many cases of those remains, for the manufacture of porcelain in this City.

There is memory that at the time of the Napoleonic wars, the firm L. Boldrini exported one hundred barrels per day of firearm flintstones from Verona, each containing twenty thousand pieces.

With the discovery of sulfur, matches for domestic use and bullets, the flint industry for firearms in Veronese began to diminish. By about the year 1835, flintstones were sent only to Dalmatia and the Levante (East) and to those maritime cities, in the high Tirol mountains and in Baviaria.

In the year 1837 Ferdinand 1 of Austria, passing through Verona, wanted to see the flint factory of the aforesaid Mr. Luigi Boldrini, and on that occasion 22 flint workers came on purpose from Cerro, and displayed their craft in the presence of the Emperor. The Boldrini Firm still sends flints today for sporting firearms in boxes from 2 to 3,000 pieces. In the plazas of Chioggia, Adria and Sinigaglia for use of the fishermen and sailiors, and the largest shipment goes to Trieste, selected for the merchant ships.

A few also go to Tirol and Bavaria; infrequently small orders of rifle flints from Dalmatia and Montenegro.

The accurate examination of a discreet series of these rifle flints, held under the eye, persuades us more and more that they have an analogy with some types of ancient knives with wide blades and double edges, or with scrapers. They have distinct characteristics, idenitifable by the type of fracture which, for the age, always appears different from that of the ancient flints, and for the color of the surface, characteristics that betray the modern origin of the pieces."

Nevertheless, after almost 80 years, the discussion had not stopped, nor had clarity between "historical" and "prehistoric" flints been completed. Not only many dilettantes and impassioned interests but even some researchers risked confusing piles of fragments of "flint stone" flints with manufactured articles of the much more ancient Superior Paleolithic (about 10,000 years ago), as seems has happened at Camposilvano, where a suspicious "paloelithic workshop" was none other than the pile of discards of the work of an abrasive factory, remembered in the memory of the local people.

In the meantime another similar problem was written and debated, with animosity, of the so-called "strange flints", numerous collections in archaeological excavations at the end of the 1800's in Western Lessinia, between S. Ann of Alfaedo and Breonio. Believed by some to be "prehistoric", by others "false", these manufactured articles, in a few years, arrived in the collections of many Italian and foriegn Museums, such that already by 1905 a well known English archaeologist, Seton Karr, denounced the falsehood in La Tribuna, a daily gazette from Rome, repeated directly by a magazine of anthropology in Paris, L'Homme Prehistorique.

It is known that even the custodians of the Arena of Verona gave "strange flints" as "prehistoric" souvenirs. It was not until 1930 and the archaeological research of professor Rafaello Battaglia of the University of Padua that those manufactured articles were definitively recognized as historical.

Giovanni Solinas: his research and publications from 1950 to 1971 expanded the base of investigation on the Veronese flint stones in the European context.

But could those "strange" items be local only by the fanciful and clever wish of some desirous mountaineer to round out his thin earnings? Had they perhaps been copied, and, if so, for what?

"Folende", "Strange Flints", and the culture that had produced them still deserve many answers, far different from the concluision that they were the "coarse fraud of ignorant country persons". Beginning in the 1950's there was attentive bibliographic and territorial research, by Giovanni Solinas, to set the problem and its solutions on solid historical and "European" bases.

He wrote a series of articles, not a simple task, on which more analysis and clarifications were written in 1971-75, that developed the knowledge of the Veronese "folende" in the large cycle, European first and then the world, of flintstones for firearms.

And as we will see, the neglected Lessinia was certainly not marginal to this important technological phenomenon that affected and shaped the economy and, more importantly, the military in all the countries for more than 2 centuries .

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From Memory to Documents

I n rural areas, cultural memory is expressed in an oral tradition, and "histories" are easily transfigured, where, since they are not directly recorded by each generation, often the wish and the pleasure of those "handed down" narrations end in confusing names and situations. But the History and the "histories" have endless points of contact in which to search and find the small daily activities, those usually not mentioned "historiographically", to articulate the duration in space and time of the cultures, and the points of meeting of each with the others.

Any culture, in reality, is not only the socio-ecological "translation" of the relationship between the customs of a population and the resources of the environment that they occupy.

Nor is it indeed simple to research the memory of the "folende" in the same places where the flint stones have been worked as a livelihood, incredibly less than 20 years ago. Even today, in the Foldruna region (Cerro Veronese) it is remembered that Giorgio of Montarina, is "one" of the Grbe, a Tognara from Lonico who struck flints for the canons" and that "Salveti was the mule transporter from Austria, to Trento". But when?

The research of G.Solinas provided evidence that Salvetti was a retailer at Cerro for the same wholesaler Boldrini of Verona, cited previously (1837-1886).

And at Camposilvano, thanks to the studies documented by Attilio Benetti (Museum of Camposilvano), memory and documents are preserved, for example, regarding "folende-pietre-focaie": yet ten years ago there was memory that "at the time of Napoleon there was work to make "folende" for s-cipo and for zalin".

Similarly, this comes up again in more than one writing by Thomas Bertoldi. At the time of King Lombardo Veneto, one discovers that his grandfather was a "folendaro" who worked in the "Benni Communi and other vegri " being forbidden "to strike folende" in private works. This job must have been well compensated, so much that with the proceeds he could have purchased a new house with sheds covered with "canel mantoam", the marsh reed wicker frame typical of the old roofs of the Lessinia.

In the same manuscript is learned that the buyers of flintstones came into Lessinia with mules from Trento, Ala and Rovereto, and sold goods from Camposilvano and silk from Rovereto and other cloth to acquire flints for firearms. The older Lessinians with political ties to Austria, for which they still keep memorial stones, were more united than divided with those populations of a similar culture and alpine economy.

In a "Letter of Dowry" of the same era, dated 1726 or perhaps 1766, one provision among the inventory of the goods carried in the dowry "the scalfaroto (stocking of rough wool) for a small woman and folende made by Sbarar from the Barba Battista near Ba". This odd combination of items is evidence, at least from the period of the 1700's, for "batar folende" craftsmen in Lessinia Comunes who cut flint chips renowned as flintstones of the proper quality. This dating, after all, must not surprise us if "stones for firearms" were sold to Castel Tesino (Valsugana-Trento) already by 1643.

Recent interviews with men over eighty years old, completed in the hills near Valpantena, Val Squaranto, and Valley of Marcellise, have emphasized, within a confused linguistic memory of "folende", (not a view popular with the interviewees), a more recent, but equally ancient practice of fire: the "solfarini", small twigs soaked in molten sulfur, known in the tradition of the high Lessinia also as "solfrati".

With great surprise one also discovers that in the morenica gardesana area, where the flint is scarce and alpine quartz pebbles, "seregni" (or "seren"), are abundant instead, it was habit up to the beginning of the century (some do it even today!) to light a fire by vigorously beating together two of these stones. Return to Index

Montarina region of Cerro Veronese.

Iron ornament of the Montarina region (Cerro).

A Tangled History of Words, Functions, Places

One strange couple has always aroused curiousity studying the "folende" :
- "folende" for the flint and all its manufactured articles;
- "assalini," apparently, for the flintstone types, it seems, in the areas not in production of the "folende."

The express action forms of the verbs "batar folende" and "batar assalini" have often been interpretted as synonymous, even with two different linguistic roots.

The first term "folenda", according to a current etymological dictionary of the Veronese dialect, is from a derivation of "fogola-fogolenda," that is from "focus" (Latin); therefore "piera folenda", the flint, and the stone that must give fire. According to an other interpretation "folende" would be an adaptation of the Veronese mountain language of the German word "flint," (but also, by extension, "hammer (rifle)"), plural "flinte," perhaps motivated by frequent commerce of flintstones for firearms production with Tirol and, probably, Baviara.

Looking at the other word "zalin" or "salin" or "assalin" (steel), we find possible roots in the term steel. From the word "acies" which designated any fighting arms of the Roman gladiators, derived because of armored steel clothing, or perhaps strength, Italian word (acciaio), Spanish (aero, pron. asro), French (acier, pron. asi) and veneti (assal). This last can be traced to the XIII century as "al" (pron. azal).

All terms, therefore, indicating manufactured metallic objects in steel, and in this sense the names of places in Lessinia, like Azzarino (Velo), and perhaps also Saline (S. Mauro), would deserve a serious verification for clarification of its possible linguistic origins, as well as the hypothetical center of blacksmiths specialized in the production of steel tools (or of particularly good tempered iron) and, among these, the acciarini.

Many of these places, after all, preserve mounds of discards of the works of "folende," noted for firearms. "Folende" were therefore the stones (flints) that gave the fire struck by a metallic object (of steel) that is l'acciarino (hammer), called "salin" or "zalin," perhaps once also "zarin."

Places and regions carrying in their name the root "assl" or, perhaps "azr" could have been centers of blacksmiths, specializing in the "salt" forge", a good, indeed, precious industry, having been the only known way for centuries to tinder fires.

Also the usual explanation of the name of Cerro (Sero) as possibly the wood of cerri (oaks), or better perhaps, "the place of large secular oaks", does not oppose this hypothesis, because the "cerro" was one of the plants most used for coal for fuel necessary to the blacksmiths.

A possible confirmation, even if recent, comes from a document of 1804 in which "Anderlone Ferraro de Camposilvan" pays a carter to have 2 loads of corn and 15 loads of firewood coal carried from the place "Busa" for "Thrones 32 + 4 blocks of salt", that is with coins of the era plus 4 dozen triggers (mazzi pron. "massi") , a commodity so typical and appreciated to be valued by the same coin.

With this reading then the surnames "bati-assalini" (or also "folendini") dated 1850 given to the inhabitants of Cerro (but, it seems, also to the inhabitants of the Country of Tanseri of Ceredo) could be ironic nicknames for a devoted community still manufacturing flintstones ("folendini," that is batterers of flint or "bataori"), but also for those who light fire with steel hammers and flint.

The same noisy practice that induced pope Urbano VIII in 1642 to forbid smoking in church, precisely for the annoying noise provoked by the steel/flint lighters.

For as unbelievable as it may seem, just in these last months, one could find right in Montarina region (Cerro), recorded among the places of the "folendini," a steel/flint striker, for which the elderly owner (Mr. Lino Gonzi) still remembered the precise use!

Finally, if there is any technological doubt that the "ferari" (blacksmiths, often rural) were able to produce steel or iron sufficiently hard for trigger (acciarini) use, it is useful to point out that we have extensive recollection of the notable sparks provoked by the shod clogs of horses and oxen on the pebbles of the pavement (quartz, basalts, flints and other

hard stones), so much to have been remembered as one of the "games" of the children of past generations.

Pavements of particularly hard fluvial pebbles (saleso) pave the old roads of the Torricelle.

Danish striker (1600). The outline points out the area of use against the flintstone.

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"Coalo Ciaro," a rare case of perfect conservation of a flintstone workshop from Trezzolano (VR).

Road Ca Palui (VR) To the sides numerous flintstone workshops documenting all the phases of work.

On the Paths of the Assalina Stone

Where flint outcropped on the surface, for at least 200 years in Lessinia this stone was worked and splintered to make flintstones for strikers, for rifles ("folende from sbarar" or "from s-ciopo") or for domestic strikers ("zalin" or "salin"). By the citation of P. Orsi we can draw the astronomic figure of more than 70 million flintstones were exported annually from Verona in the Napoleonic era.

As we will see then, France, universally considered the most prolific manufacturer of flints for strikers, created 30-40 million per year during the same period. Perhaps both the figures should be verified, but in each case the Veronese production was equal in European importance. There is memory, for instance, in 1817 of Veronesi flint exports to Denmark, where good flint production was insufficient in that age. In the rest of Italy, as we know, only in Sicily were flints made for strikers (1781), while in the Gargano, the other Italian province where flint abounds, documents are not known.

Flint does not outcrop on the surface in all Lessinia, however: only in Cerro, Lugo, Trezzolano-Mezzane, S. Ann of Alfaedo, and we believe in small measure, or perhaps less investigated, S. Mauro odi Saline. Other "workshops," as the heaps of worked discards are called, apparently isolated, are known in Tregnago (Cogollo and M. Gardon), and Coghetta (Valfiorita of Arbizzano), zones geologically at the limit of the outcrops of flint, while there are small areas above Grezzana in Vajo del Paraidso and in the Gualiva of Monte Cucco. The quality of the flint, besides, are often different in each zone. From the locations of the "shops" we can deduce some tipology:

- in riparian subgrade or at the entrance to caves;
- along old cart roads;
- at the edge of inhabited regions;
- under old isolated trees (some rare cases, in which, however, we do not know if indeed the tree already existed).

In the French sites and English, as in the prehistoric neolithic age, the flint for flintstones were dug out from wells and deep galleries.

Old cart path that descended from Gualiva into Val Squaranto. At least 5 small workshops for flintstones [pietre focaie] were documented at the sides or even on this same path itself.

We notice as two principal distinctions: near and far from the houses, a fact that implies a permanent craftsman or an active itinerant, even complementary to each other. In at least one case, under the "senge" (rocky outcrop) at Lugo, there is interpreted a small "workshop" under a shelter, tied to the activity of pasturing sheep, but elsewhere, in absence of the necessary excavations for verification, interpretive elements have not emerged today. In a document of 1841, it is lamented that damages to agriculture were provoked by shepherds and by the "quarrymen of flintstones", these last because, devoted to looking for flints, hoeing here and there, tearing the grassy carpet and leaving the fields covered with splinters and flakes, deadly for the swing of the scythe during reaping.

The "folendari", "folendini" or also "folandieri", were artisans, some permanent residents, and others itinerant, as remembered (1830) by Schio, a Tasino (inhabitants of Castel Tesino of Valsugana, known for their itinerant commerce) who picked up flint on the mountains, worked it on a wooden log in a piazza in the village and sold the flintstones.

From the memory of Bertoldi of Camposilvano we learn that the old "folendaro" already quoted had engaged 2 "cataori" (collectors of flint) and 3 "bataori", and paid a triple mower of hay, meals of polenta in the morning and at midday, and at night a "round of sbrajo" (bowl of barley soup).

In this case the folendari were cared for by artisans who became small entrepreneurs on behalf of the itinerants. It seems logical to deduce that these small enterprises flourished by contact with places of similar stable commerce, such as:

- areas with a weekly market;
- cart roads where heavy barrels or hampers of "folende" were carried, for transport to the retailer;
- regions of blacksmiths specialized in strikers, who also could perhaps depend on one or more "folendari".

Research and documents leave us to suppose that the Veronesi "folendari" sought the flint in the thick blankets of "red" clay ("tonega" soil), rather than digging wells and galleries, as was the case in France and England, where the better flints were deeply buried in the calcareous layers.

At left: Mr. F. Edward (Brandon, 1935), one of the last " flntknappers", the English artisans of flintstones in black flint. On the right: Reconstruction at the Musee de Pierre Fusil di Luay-le-Mal (Tours, France) of a "cailloutier", a French "folendro", at the workbench.

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The Techniques of Workmanship

The uncertainty that the workshops "of folende", or worse yet, of any isolated "folenda", are prehistoric was founded upon the apparent similarity between these flintstones and those prehistoric, but in an analysis of the techniques of workmanship the problem is easily resolved.

Even though a blade remains, by definition, a long splinter at least double its width, numerous other characteristics, that reflect deeply different methods of design of the article, divide a "pietra focaia" flintstone blade from a prehistoric one.

While this last is the result of tens of thousands of years of refinement of ability and fundamental techniques on the use of the so-called "tender precursor", that is hammers or chisels of reindeer or buck horn (or perhaps also hard woods), the technique of the "folende" for making baldes is instead based on tools of iron and steel.

With the metallic tools, the start is the concentration of weight at a precise point, on which the metallic "stain" often remains visible, since iron and steel are less hard than the flint. The prehistoric techniques, whose evolution is indeed too long and complex to discuss in this essay, were instead based on the speed of the horn hammer and on the accurate preparation of the point of impact, or of the support. Subsequently (in the neolithic era) elaborate objects for pressure or wooden mechanisms with a point of horn were used, that detached blades uniform in all their dimensions (length, thickness, section) and they resulted in the reduction, almost disappearance, of the so-called bulb, that is the "cone of strength" behind the point of impact or pressure.

1) Core of blade removed by impact
2-3) Typical blade
4) Use of pectoral pressure
a) technique for removing the blade using a chisel of horn (Paleolithic Superior)

Scheme of sequence to cut "folende" for a hammer:
1a) sectioning of the nodule (1) creates a plane on the main stone (1a)
2-3-4a) detach surface blades (discards)
5-6a) detach blades of flintstone
7-12) splitting up of a blade into the passive chisel(s) inserted on a wooden bench (p)
7-13-14) regular flintstones

m) hammer for outlining
m1) hammer with two points to detach blades
m3) French hammer to cut and retouch (round).

On the contrary, often, in the blades from the "folenda", a well developed bulb results from the impact of the hit. Also the cores, that is the form of the blocks from which they are disconnected, tended to be "pyramidal", but perfectly recognizable as distinct to anyone who has practised experimental archaeology.

Two craftsmanships therefore well distant in time, of which the second, that of the "folende-flintstones", with its independent development, which in its terminal part (1600- 1700) reinvented its way in the series of cuts of the flint in laminar splinters, with a purpose totally different from that of the prehistoric artisans, perfected in order to produce, it seems, up to 2,000-4,000 pieces per day. The blade was then devised for this purpose, to produce from each one 2 or 3 quadrangular flintstones.

In respect therefore of the supposed "primitiveness" of populations in Lessinia who have continued to splinter the flint from prehistoric times, it serves to remember that the remaining Mediterranean archaeological data indicate that, beginning in the final Bronze Age, the manufactured articles of flint became more and more rare and cheap, to disappear in total by the IV century A.D. Also the "strange flints" seem more understandable as attempts to imitate prehistoric manufactured articles, even including images and historical symbolisms, departing however from the technincal ability of "folendari".

We add that, in the known Veronese documentation, another probable dualism exists:

- in the sites near the countryside (especially Margiuni, Cajo di Trezzolano, Camposilvano and Castagne)we find traces of all the worked series: nucleuses, blades and their transformation in finished stones ready for use;
- in other sites, especially those along the paths, instead only the production of blades is documented.

It seems logical to conclude that the more specialized craftsmen-entrepeneurs would have been most likely to produce all the series up to the finished marketable product, and that they preferred to set their workshop out of the house or region.

On this last aspect it is enough to remember that the English "flintknappers"and the French "caillоutiers" (the folendari artisans) in 10 years of average activity contracted silicosis, whereas the average age of a worker who had begun as a boy was around 30 years. The unique remedy ascertained was to work in the open!

The question for now remains unresolved whether the "folende" were commercialized in the ready-for-use form or as blades or splinters, as we might suppose from recoveries in Alto Adige (Aicha di Vipiteno), Rimini and other small sites of the Veneto, especailly in the lagoon of Venice.

For this purpose, it seems meaningful that in Austria (1787) the discards of the industry for musket stones went to the State as they resold the strikers for civic use, an evident sign that a whole blade, knowing its cut gave only 2 or 3 first-quality flintstones, but also 2 or 3 discards, was useful and perhaps marketable for uses other than strikers.

Blades from Veronese flintstones:
a) typical blade (Style of the House Palui);
b) atypical blade (Style of Cerro Veronese).
In any Veronese style, especially using very glassy flint, "strange" blades could be confused with prehistoric types.

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Firearms and Flintstones

Shot powder, the basic element for all arms that use this type of propellant, has imprecise medieval origins, richer in legends and superstitions than that of documents, such as the one about a monk-alchemist, Bertold Schwarz of Friburgh who invented it in 1312. The explosive mixture of saltpeter, charcoal and sulphur, was much more likely discovered in many parts of the world, according to some of the Arabic alchemists.

The use of firearms (the English bullet) seems to date back to a document older than 1326, lit probably by inserting a red-hot iron in a hole of the weapon (called "focone") that ignited the gunpowder set inside the weapon. But already by

the middle of the same century almost all the Lordships and the States possessed some examples, quickly developing into tools of major military offense, physically destructive as well as psychological, even if the precision of their aim was poor. It seems that the army of Signoria Scaligera is, in this sense, among the more technically advanced of its time.

From the first years of the 1400's, hand guns, help by individuals, were equipped with the first rudimentary metallic mechanism, the "serpentine", that allowed the lit fuse to approach the "scoop out", a small hollow flask of a dose of black powder, communicating through the "focone" (fuse) with the load inside the barrel.

Nodule of marcasite recovered in Val Hen (Avesa-VR).

The plate of a musket for a flintstone striker of 1700.

This innovation, with its following improvements, allowed the use of both hands to hold up the weapon and, somehow, to aim, but it still had many drawbacks, such as the need to hold the fuse (a large cord boiled in a solution of nitrate of potassium) alit. Nevertheless, the "hot plate to fuse" was used until 1700, for its simplicity and economy.

Between the end of the 1400's and the first years of the 1500's, also related, it seems, to improvements in the technology of steel, the first devices for mechanical shot ("piastre", "hammers") appeared in Europe. Some researchers have observed how a sketch in the Atlantic Codice of Leonardo da Vinci from 1510 appears to be a hammer device similar in detail.

The production of "wheel" firearms (ruota) was advancing, in which a "rotino", spring-loaded with a striker, turned quickly to contact a piece of "pyrite" (a sulfide of iron mineral) firmly held back by a special clamp, called a "dog".

Naturally the effect caused sparks due to the friction between the steel of the "rotino" and the more tender pyrite, or another harder sulfur mineral called "marcasite". One or the other was held firmly between the jaws of the "dog", cut in the form of a parallelepiped for the purpose .

War ax (15th Century) with "fused" rifle (fucile a miccia) incorporated in the handle

A Musketeer (1608) with "fused" rifle

A mercenary loading a "fused" rifle (1660)

One needs to notice however that this technique of making fire by striking steel against pyrite or marcasite, or, as we will see, against other flinty stones harder than the steel, was already in use for many centuries.

The "azzalinieri", specialized artisans in the construction of "azzalini" (triggers), that is the metallic hammers for arms, used an older technique, promoting an application of flintstones of a form adapted by necessity to the new metallic mechanisms for firing.

The effective, precise and manageable "wheel" arms, were therefore expensive and quite delicate since only the "azzaliniere", or perhaps a watchmaker; was able to produce or repair the mechanisms.

In the same period, in the variegated world of the artisan-gunsmiths appeared mixed-arm products, like the famous crossbows preserved in the armory of the Ducal Palace at Venice: constructed in Germany probably at the beginning of the 1500's, they are considered the most ancient arm known for mechanical "wheel" ignition. Evidently the combination crossbow-arquebus (one of the names given to the most ancient of long barrel firearms) was intended to double the war potentialities of the weapon, but those mechanisms experienced fragility and therefore were not completely reliable.

Another characteristic of the "triggered" devices, common, moreover, in the first arms following the "acciarino" (striker and flint arms), was the notable variability, due prevalently to the artistic handiwork and to the inventiveness of the individual "azzalinieri".

Nothing or almost nothing is known of the mining and of the commerce of the pyrite, except for an English sulfdie of iron mine from 1586. In the second part of the 1500's, while "wheel" arms and pyrite came to improve progressively, inaccurate reports were made of the more ancient forms of triggers "for strikers and flint".

In the same period, according to the study of the Frenchman J. Emy, some experimented with the substitution of the fragile pyrite, that crumbled behind the delicate rotating mechanism often serving to jam it, with a "very thin plate" of white flint (the better quality), partly avoiding this risk.

The advent of the triggers "for stiker and flint", called in ancient times in a general sense "rifles" "focile" (from Latin "focus") and singularly remembered by the term, still used today: "fucile", common to the Spanish: "fusil", to the French: "fusil" and to the Veneto: "fusil", where the word "s-ciopo" is

Schematic of a simple fused mechanism (8 pieces - serpentine fuse)

still present, indicating as early as 1300 "aggressive" fused firearms ("sclopi", schioppetti, "escopetas" Spanish) and also, subsequently "wheel" arms (called "da preda", that is "by stone").

1) German wheel rifle of 1600
2) Operation of rotating the wheel mechanism
3) Exploded view in 19 pieces of a complex, and quite delicate, trigger wheel) no. 2: rotino

Key for loading of the "wheel" rifle (right)

Many researchers attribute to the French gunsmith Marin le Bourgeoys, about 1610, the form of rifle known as "alla moderna", that became a standard in the second half of the 1700's for the infantries of the European armies.

First mechanism (trigger) with stone striker (flint)
a) "baltic" striker
b) Spanish "michletto" (mica)

English pistol with flint striker (early 1700's).

This form remains until almost the first half of the 1800's, when the new techniques were applied to strikers based on the employment of capsules of "fulminate of mercury" (about 1830), where this chemical substance took the place of the flint stone, as half of the ignition charge of powder.

The arms equipped with "strikers of flint" however stayed in use for almost another century in all the areas "poor in technological levels", mainly in the English colonies, where the use of cartridge arms was for a long time prohibited for the "natives".

An unusual anecdote, relating to the revolt of the Cipays of India in 1857, reports, for example, that the cartridges, lubricated with a mixture of bovine tallow and wax, were presented to the opposing sides making them believe that they had been treated with pig fat, an impure animal for the Moslems, or of ox, a sacred beast to the Hindus.

Evolution of Types, Techniques and Commerce of the Flintstones

It has been emphasized already how steel and flintstones (pyrites, marcasites, quartzes, flints, etc.) have been the combination fundamental to the start and development of firearms following the intial fuse-to-fire mechanism. It is curious, by chance, to note that, according to a French legend, it is thought that bandits invented the arms with triggers (acciarino); the wheel (ruota) being too expensive and eliminating the smoke and flame of the fuse-to-fire (miccia) in order to effect "surprise" in ambushes.

As we will see in the following chapters, returning in time toward more and more rare documentation, the use of "triggers" (acciarino) was very ancient: dealing with the ability to beat a piece of flintstone of the correct form and hardness with a piece of steel.

If we know little of the "acciarini", still less is known of the form of the flintstones or, worse yet, of their quality. Emblematically, the word "pyrite" (today used specifically for an iorn sulfide mineral) was defined in Greek as "flint" (selci), therefore it was a different type of flintstone than pietra focaia. A natural block of pyrite or other flintstone was probably the most ancient form, as a simple splinter or fragment of flint (selce).

English flintstone, still in commerce and used for the modern shot with a flintstone rifle.

French military flintstones (about 1800) found in an old deposit in Valtrompia (BS).

Furthermore, a splinter of flint, harder than the pyrite and sharper at the sides, was able to be formed into thinner splinters, increasing the intensity of the strike against the steel and more easily inflammable.

For the first gunsmiths who produced the "iron hammers (piastre)" it was preferrable to avoid fractures, and they therefore chose among these stones the most proper for form, hardness and sharpenness of the edges.

Naturally the result of the early phase of search for the good flints, was that which made a better spark for a greater number of times without damage to the precious steel hammer.

This last, in its oldest form, was not smooth but scratched to obtain good sparks. It seems furthermore that in Europe, perhaps for lack of adequate research, sites of production of these older flintstones for rifles are not known today.

After all, the exact "atypical" form of these splinters, along with their limited production, would be recognizable only

through a scientifically conducted dig of a worksite, where the technically homogeneous discards and perhaps any other datable objects (coins, ceramics, etc.) could certify the archaeological context.

In this sense help has come in the form of accurate excavations of Indian sites in North America, on the East coast, where European colonization first arrived.

The oldest date noted is 1600-1620 in Pennsylvania (situated in Washingtonboro, then an Iroquois village). From 1630 to 1650 the most common type of hammer (piestra) found in these sites was the "snaphaunce trigger (acciarino)" that is the archaic form (of "Baltic" Dutch origin) of a flint trigger (acciarino).

This hammer was the contemporary of a different but equivalent "Mediteranean" form called "miquelet". The relative abundance of "hammers" as outfitted funerary in the lroquois sites of the period, has been interpretted as collections not for firearms but simply for devices to make fire.

Only with the successive intensification of commerce and traffic with the white farmers would the redskins of the Northeast have been in position to have and use rifles, so much that beginning from 1650-1685 they seem to have stopped making flint arrowheads.

From 1630 to 1675 the Iroquois made flintstones for triggers (acciarino), splintering flints or local quartz cleverly in a bifacial way or even readapting suitable old arrowheads, such that, by comparison, the contemporary imported Danish flint stones from Europe seemed rough indeed.

Evidently during this period in North America a regular technical ability developed to splinter the flint that was historically wasted for more than 2000 years before in Europe.

In Europe, instead, from 1650, a new style of flintstone was introduced called "wedge type", that is "a cuneo", essentially still drawn from short splinters retouched on three sides, in a way to furnish the regular form for the clamp (dog), leaving thefourth side naturally sharp to beat on the surface of the "hammer" (martellina).

The problem of the flintstones produced in Albania until 1800 for the Turkish and Arab market remains unresolved for now: they were splintered in a bifacial way, as though from Portugal, but the Mediteranean origins of this technique are not definitely known today, so they could have emerged earlier.

Dating back to 1643, significantly, the oldest European report:
- for the cutters of flintstone at Meusnes
in France, were called "caillоutiers"
because "caillou", that is a pebble of
hard stone, and not the learned latin
"silex", was at that time the name for
French flint;
- for the flintstones sold at Castel Tesino
(Trento).

England has also returned interesting data on the chronology of production and types: in 1654 "flint-stones", that is "pietre-selci" are recorded, while in 1681 "flints ready cut", that is "selci tagliate-pronte" (for use) are noted. In 1660 the "wedge" form already described were produced in Kent and in Wiltshire.

Tinder-pistol: domestic trigger (acciarino) of flintstone, complete with candle and whale oil lamp (Pennsylvama.

1700-1750).

Hypothesis of chronological sequence of the Flintstone fuse (pietre focaie da fucile) from lroquios sites of the Northeastern U.S.A.:
1) flintstone [pietrafocaia] ([p.f]) in Danish flint.
2) flintstone in local splintery flint of the lroquois (1 and 2. around 1640);
.3) [p.f]. In Baltic flint, "wedge" type (1650-1780)
4) [p.f]. in French flint, type used to light fire
5) [p.f]. military of "French" style, in flint of Meusnes
6) [p.f]. of "English" style, in black flint of Brandon (GB).

1-2-3-4-5-6: types of "dog" for trigger (acciarino) from stone found in the Iroquois sites (1620-1680).
7-8-9-10: manufactured articles of the Iroquios necropolis of Strickler (Pennsylvania, 1640).
7-8, arrowheads.
9, flintstones in local diaspro.
10. flintstone in Danish flint.

From 1654 to 1681 the English market registers a neat modification of the typical products, splinters were sold by weight and "flintstones ready cut" were sold by number. The manufacturers of these flints tare not known, only the sellers, who were the same gunsmiths.

One study reports 1663 as the oldest date in North America for the recovery of flint materials following the initial production of the blades, and it reports that they have been found in zones of French influence.

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Work Bench. utensils. and kegs (used as containers for the stones for sale). Musee de the Pierre to Fusil of Meusnes (Selles-sur-Cher. France).

The procedure to position the musket prescribed in 1766 for the French infantry.

The Military "Boom" Economy for Flintstones

Beginning in the first years of the 1700's two facts influenced the form and quantity of flintstones production:

1. The progressive military adoption of the hammer musket (starting 1708);
2. The increasing standardization of the types of military arms, now known as "arms of ordinance".

The armies then became the prime applicants for flintstones, even more reason to conform to the "standard" models of the mechanisms. This phenomenon grew steadily as any natural locations of excellent flint became places of "government" manufacturing centers for the military flint, such as Meusnes in France and Brandon in England.

Such centers also came to be protected as "military secrets", as well as commercial, even under punishment of death, like Meusnes at the time of the napoleonic wars. And those villages attracted many specialized workers; hundreds of different persons were assigned full time to the various tasks in this "craftsmanship-industry"

The median age of the workers was only 30 years, and therein was influenced, not only the "silicosi" condition, but also, by their inexperience, the frequent collapses in the galleries dug in sandy grounds (Berry, France). That is why specialized equipment was crafted, metallic utensils for each phase of the work, and with regional or national variations.

The same French "record" (40 million pieces per year) can also be seen again, if as seems a good "cailloutier" (but also an English "flintknapper") was able to cut from 2,000 to 4,000 flints per day. On this basis maximum figures could be calculated at l00 million pieces per year for a 100 person operation!

Therefore, great economic and military interest revolved around the European flintstones, so much so that some countries unprofficient in this technology gave huge sums for the production (Austria 1787) or even effected actions of military espionage (envoys of Prussia in France, in 1722).

In fact, in normal times, 2/ 3 of the French production was exported, so that armies and adversaries ended up using stones of the same origin. In 1815, after Waterloo, with the end of the napoleonic wars, application and prices of the flint stones collapsed, such that at Brandon (1816) there were great popular rebellions against the obvious situation of unemployment.

France and England continued, in different measure, a reduced production, later on along with the introduction of new

mechanisms for lighting "the capsule" (1830-40). The English, heavy into its own colonies, continued to make flintstones ("gun-flints") until 1850, also with comissions for export, as that of the million stones to the Turkish army in 1853.

On this point, some researchers have emphasized that the technique to cut the stones by the "passive chisel" ("by the English") furnished better stones, yet the actual evidence of the sites, including French, indicate that this "secret" was quite soon, if not contemporaneously, also used elsewhere. At the beginning of the 1900's there was almost no more flint work in France, while in England this craft endured until 1935.

In the organizatoin of the work, often the finishing touch was made by women and boys (France and England).

It is anchored today, in Brandon, by one old artisan, Fred Avery, who continues the activity, for a European and American market of hobbyists of the art of muzzle-loaded flint rifles.

Tools of the French "[caillоutiers]":
a: hammer for roughing
[b-e]: hammer with 2 points to shear blades
[d-f]: chisels for fractioning the blades (obtained from old steel files)
h: hammer for English roughing
[h-g]: French tools.

Sequence of cocking and shooting of a "modern" flint stone rifle
f: flint stone
m: striker (martellina)
s: container for the gun powder

Notes on a Tricky Chronology of the Veronese "Folende from S-ciopo and Zalin"

The attribution previously advanced for a beginning of the workmanship of the Veronese "folende-flintstones" in the first half of the 1700's and therefore broadly reasonable in the European chronology, could even be late by at least 50 or perhaps 100 years.

The international bibliography of the topic almost ignores the Veronese. The gunsmiths of the Valtrompia (Brescia) were already famous by 1500, and a decree of the Veneto Senate in 1727 thanked them for their important productions.

The same gunsmiths are remembered to have sold excellent flints. At least from the second half of the 1600's, with progressive advance of the flintstone musket, when already in Castel Tesino (in the Valsugana, certainly not as rich in flint as the Veronese mountain) the flint stones were sold. Could the careful Venetian economy ignore the flintstone wealth of Lessinia?

More probably it seems that the same "commercial-military secretiveness" also worked for our region; however during the French occupation, from 1796 to 1814, a "great" resource of such importance was certainly not ignored.

Workshop of the House of Paliti:
a) large blade from flint stone
b) plane of percussion and typical bulb
c-d-e) splitting up of a blade (reconstruction)
c-e) discards of workmanship. They form the mass of the heaps, from where the blades (a) and the regular stones (d) are almost absent.

In the absence of, and in waiting for, a serious program of stratigraphic investigation of the Veronesi "workshops", we must observe that in all the tens of verified sites we have found everywhere, the manufacturing employed a laminar technique, though in some this is not prevalent. This fact depended on the form and dimensions of the masses of available flint in the area.

Coin from Veneta Republic (Doge Francis Contarini 1623/ 24) found at the shop of flintstones of Cajo (VR).

Furthermore in the sites where blades were transformed into stones ready to use, we have found that the technique of fragmentation by the passive chisel was most popular, and the overwhleming majority of stones were in the "English" style. And if other doubts remain in the european chronology so far proposed by the different authors, this could suggest that the Veronesi production "in kind" was initiated in the second half of the 1700's.

Only in the workshops of the Trezzolano-Cajo area have we been able to compare stones of the "French" and "English" types mixed at the surface. But when and where this enormous production was traded no evidence up to the present seems to have emerged,

not even in the vast sampling of the Venetian Lagoon, where "black English" and "white French" flints have been discovered, much less in the isolated sampling collections in sites of the Veneto alpine pastures, where more have been found in the form of raw blades.

Only a fleeting indication comes from a Venetian coin of 1623 (Doge Francesco Contarini), unfortunately collected in a site-workshop of Cajo, characterized by the "English" cutting techniques.

The tradition, finally, of a "School of Artillery", well remembered in Verona in the historic center near the marble portal called "for the bombardiers" (1687, Cortile del Tribunale) and the long activity of "nitriere", cultivating the saltpeter for gunpowder in the "tezoni" of Piazza Cittadella (Via Tezone), lean toward a history of the Veronesi "folende from s-ciopo and zalin" at least as long as that in the rest of Europe.

Types of flint stones (Pietra fociae, p.f) recovered in the Veronese:

1: military p.f of "French" style, in white flint of Meusnes. Stone of Foiano (exemplary, till now, unique)
2-3: military p.f. of French style, in flint of the Lessinia;
n. 2 from Stone of Foiano, n. 3 from work shop Ca Palui
4-5-6: p.f. from Stone of Foiano (probable use also civic)
7-8-10-11: p.f. unfinished from Margiuni shop
9: p.f. of "English" style from the workshop Ca Palui.

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From the "Golden Fleece" to the Piezoeletric Lighter

It seems that a precise documentation of medieval techniques of fire is missing, even if many researchers speak generically of the use of very stylistic and elaborate metallic triggers (acciarini).

Definite improvements in the metallurgy of iron and steel are cited from around 1200, and the trigger (acciarino) for fire,

appears by 1100, stylized, in the coat of arms of the Kingdom of Bulgaria and it seems in use since the Roman age.

In the absence of the more precise and meaningful documents noted, the coats of arms of an important chivalrous order, the "Toson of Gold" founded in 1429 by Phillip II, Good Duke of Borgogna, have been able to unintentionally record the techniques and the prestige of the triggers (acciarini) and of the flintstones.

This order has for "chivalrous" purposes taken on the defense of the faith of the Western world, manifested in the symbolic wish to remake the Greek myth of the "golden fleece", researched with courage and tenacity by Giasone and the Argonauti; since 1429, the coat of arms includes a special collar of gold, whose vest are formed of stylized "triggers" (acciarino) .

The back of an old steel hammer, sometimes still used today, for instance, in Gargano, as a steel striker (acciarino percuotendolo) effective against the flint.

On the collar are also set numerous precious "hard stones" or laurels set on blue enamels, shooting symbolic sparks, in the form of lightning arrows.

According to the graduate student J. Withoft (Pennsylvania University), the coat of arms, in the oldest forms, included the use of a yellow-gilded flintstone (pyrite or marcasite), at times substituting the same for the "golden fleece" while by the end of the 1400's it seems the flint is recorded regularly as selce (Veronesi silica flint).

(Above) The collar of the Order of the Toson of Gold is composed of "acciarino" triggers reproduced in gold, and from enamels or precious stones, bursting and sparking, symbolizing, thereby, also flint stones

(Below) Medieval Heraldic symbol of the trigger (acciarino).

Micro-shavings of steel worn from the surface by use of the trigger (acciarino). Some has been fused during the lighting of the tinder (magnified about 30 times).

More probably the techniques of fire have followed the history of the local economies, first through technological progress, and then the triggers (acciarini), embellished with decorations of the royal courts and of the well-to-do classes, together with simpler techniques of fire, based on each type of flintstone available locally.

Advancing toward more elaborate techniques, we note how in 1700, for instance, mechanisms are present in the

English Western world called "tinder-pistol" or "tinderlighter", which imitate triggers (acciarini) in the form of "table pistols", still made today as lighters, from firms such as the English Dunhill.

A passage in the "Promised Bridegrooms" by Alexander Manzoni clarifies the procedure: "he takes out his tinder, stone, trigger (acciarino), and match and lights his Janternino". Not a simple maneuver therefore, rather substantial, to strike the trigger (acciarino) on the flint stone, cleverly make the sparks fall on the tinder (a prepared mushroom, known, as we will see, from prehistory!), induce the fire, from this light a match (zolfanello) (small stick with a point of fused sulfur), and with the flame of this light the lantern.

This sequence justifies the popular habit to preserve and "lend" the fire (frequent in the old houses of Lessinia).

The sale of a "fire-kit" (English term to define the necessary items to make fire) was popular by at least 1700, and the more common method was the "tinder-box" (English "tinder" (esca) and "box" (scatola)), a metal box in which to keep the tinder and stone dry, having on its outside a plate (costolatura) of steel on which to rub the flint. It is curious to note that in Lessinia in the past the metal trigger was remembered as "lesca".

An old Veronese saying, many decades in disuse, defined a very poor family as "no I gha gnanca el tacafogo", (without a fire source) most probably not referring to the expensive matches, but the approximate equivalent of a "fire-kit", consisting of flintstone ("foIenda" or "seregna"), tinder and, perhaps, a trigger.

In the meantime, already by about 1830, the production and use of striking matches was initiated, and in the same period a wick of woven cotton replaced the ancient tinder-mushroom. This progress naturally was not instantaneous, not only by nation, but also for economic reasons, such that until 1930 the "solfrati" or "sulfur" remained in use in the country (Lessinia, Veronese hills and Mantovana lowland), a more ancient form than zolfanelli described above.

1878 saw the invention of an alloy of iron and cerium that causes abundant sparks when struck; it is the small stone that still is used in our present gas lighter. These "piezoelectric" starters were finally patented in 1966, practically yesterday.

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Other Historical Uses of Flints

No history has recorded all the other uses of flint. While its use was common, naturally in the areas where it was abundant, such sound material was used for construction of walls and even castles (as at the Grand Pressigny, valley of the Loira, France) or churches (Canterbury, England).

Lessinia has however handed us down a simple but precise memory of the material as being sharp, certainly a favorite of the locals acquainted with the cutting of flintstones. At Camposilvano, for example, a large splinter was used, in part, to cut cheese for seasoning from the salty crust for the purpose of avoiding rust on the household's precious knife.

Small partially pointed blades also served for "curapipe" and for woodworking awls, as in the work of the "architects", for bird traps, while large splinters served to cut glass and leather, or in the finishing of the surface of the slabs of wood.

In more recent times the flint was ground to make grindstones and abrasive papers, and for industrial purposes in

machinery, creating however, again, deadly cases of silicosis in the employees.

An old sled for threshing (tribblum). fitted with flints before a house of the Turkish plateau.

In the work of the fields the use of the flint was common to sharpen the edge of scythes and sickles during the harvesting or the reaping, but far and away, the most amazing is the Mediterranean use of the "tribolum", an axle for threshing wheat and cereals armed with hundreds of flint blades, carefully attached. It was pulled by animals (ox, horse), and the driver was seated above, to augment with the weight of his body the "trebbiante" effect, that is to separate the seed from the straw. This utensil already was well known in Roman times, and even today it is in use in the Anatolian highland (Turkey). Iron or other hard stones followed the local economy, inserted at times instead of flint, as in the case for which we have found evidence at Turano (Midlands, Verona), where blades of flint substituted readily for the iron teeth in wooden harrows.

Turkish farmer who drives a "tribolum" hauled by a pair of oxen.

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The Stones of Lightning

The production of prehistoric manufactured articles of flint and other hard stones ceased around 1000 A.D., and entered, at the turn of centuries, into a part of the magic and ritual tradition. Already by the VIII century A.D. in different settlements, as in those of Lazio at Osteria dell'Osa, manufactured articles in carved prehistoric flint became ornamental objects, like elements of necklaces or pendants (especially arrowheads).

In light of the data emerging from this research, in which we have emphasized how in one century the precious trigger (acciarini) passed from a popular daily necessity to general forgetfulness or to faded memory (maybe under different names, such as 'desca' "), this "rapid" passage from practical functions to other rituals, and, ultimately, to myths and superstitions is no surprise.

Still, in the Roman Age we find documented sacrifices of tamed animals with a knife of flint to seal the peace treaty. Jupiter was the god of the solemn vows, armed with "keraunos", the lightning, a mythological weapon, a small split thunderbolt, a small double headed ax.

In all the prime classical traditions, (Plinus, 1st century AD), medieval, and later popular times, the stones of lightning were known as "ceraunie". Less well know as "brontie" (stones of thunder) and "ombrie" (stones of rain), otherwise noted and named according to the regional tradition.

Other ritual uses are remembered for blades of flint in the practices of embalming by the ancient Egyptians, and in the biblical circumcision. But proceeding toward historical times and traditions, the flints and the smooth prehistoric axes, together with pyrites, lignites, marcasites, quartz (almost all the flintstones), and even shark's teeth fossils, are remembered among the various popular traditions as "stones of lightning", otherwise understood to be the result of the strike of the thunderbolt against rock or, more often, the point of the

Prehistoric manufactured articles, believed to be "stones of lightning", used as amulets.

same lightning. The arrow ("sagitta", "saetta") "sites" are still today, in the Veronese tradition, not only the lightnings but also the places of lignite and marcasite sites that are discovered in the "galina" stone of Avesa or in the fields of the Valpantena.

It is possible that "sites" can also be a popular Veronese interpretation of "marcasite" (from the Arab "marqashita", an alchemic word used for the metallic sulfur), that is stones that mark the point of the lightning strike (marca-site). Nearby in Veronese Cerro a "Mountain of the Sites" is still remembered today, a name that would perhaps merit more research.

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Fire Chosen, Preserved and Produced

The techniques of production, maintenance and transport of fire have been of fundamental importance for the hominids in the conquest of new ecological niches and environments, from the arid savana, where the fires develop spontaneously and devastatingly, to the humid forests where just to conserve fire is a problem, to the glacial steppes deprived of combustible wood.

Practicing the production of blades by splintering hard stones (especially quartz) for almost 2 million years and able in this way to cause sparks, the hominids had perhaps unintentionally tindered the fire. A recent discovery in Kenya (Chesowania) has taken the evidence of the most ancient of use of fire back to 1.4 million years, but the ability to identify the use of hearths on the inside of dwellings dates back only 700 to 400 thousand years ago, such as at the sites of Terra Amata (Nizza) and Chukut'ien (Pechino).

It is difficult to say if that fire was picked from a natural source or produced intentionally, but certainly it was preserved. Since then, up to the last century, man has been mainly conserving fire, while he knew how to create it, as already determined in the late Paleolithic, around 14 thousand years ago. In the sites of Laussel (France) and Troude-Chaieux (Belgium) nodules of pyrite have been found, with evident traces of striking.

Subsequently, in the Mesolithic, the documentation of this practice multiplies, as in the site at Star Carr (England, 7000 years B.C.) where, among the pyrite and typical everyday flint articles, quite a lot of pieces of tinder have also been recovered, mushroom (Fomes fomentarius), shaved to easily receive the sparks. Later in the first agricultural cultures (Neolithic, 5000-3000 B.C.) the lighting by flint and pyrite is associated with tombs, acquiring value therefore also symbolic and ritual.

A mineral used as a substitue for flint was marcasite, another iron sulfide, easily and quickly workable, that dissolves in the ground in which it is buried. In the following Iron Age this metal was a precious substitute for metallic sulfur, so they effectively went back to flintstones.

In the Roman Age finally different sources cite related activities:
- striking a flint (silex) against a key of iron;
- making "zolfanelli" dipping fuses in molten sulfur.

For instance in the sixth book of Aeneid we read: "they search for the seeds of flame hidden in the veins of the flint", therefore the flint was used in percussion to ignite fires in the tinder.

For more than 10,000 years, pieces of iron sulfite (pyrite and marcasite) have been used to make sparks by striking with flint

The practice of making sparks by beating flint against flint and using dry marrow for tinder with the wild fennel, has lasted up to a few decades ago in North Africa.

Finally we note how populations of historical hunters-gatherers, like the Indians of America, the Amazonians, and the Bushmen of the Kalahari (South Africa) have used exclusively the techniques of rubbing of hard woods against tenders woods, particularly effective if practiced with the so-called "drill of fire". The Kung San, a Bushmen population still today in a hunt and gather economy, have passed from the traditional techniques of fire only in the last decades to the "flint-and-steel", that is the trigger (acciarino) of flint, commercialized in the English colonies, because, despite that it has a minimum cost (around half dollar), it allows them to light the fire in only 20 seconds, where the traditional system of friction with a stick of hard wood employs an average of around 90 seconds.

Techniques of lighting the fire by friction with woods of different hardness.
1)" drill of fire" (Eskimo)
2) "drill of fire" (African)

hole for the stick
lighting of the fire
drill by arc
the tinder placed in the hole

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Origin of the Flint

The present flint in the Lessini Mountains is a sedimentary rock contained in layers of calcareous white stone, the Biancone, formed in the sea depths that covered the Veonese around 130 million years ago (Cretaceous period). Because of its thick stratification the Biancone is broken up easily by action of the atmospheric agents, and eroded in slopes of soft morphology, today generally in meadows, pastures or more rarely in woods of local chestnut trees.

Following chemical dissolution of the calcium carbonate, the Biancone stone changes slowly into clayey red soil, where the flint, instead remaining unalterable, deposits. In this way on many slopes of the middle and high Lessinia the flint abounds. The fine grain of the crystals of microcrystaline quartz (from 0.05 to 0.02 mm.) that constitute the flint, confers on this sedimentary rock a consistence of material very compact and homogeneous.

In it, the planes of fracture induced by striking can therefore propogate in a predictable way, as on the surface of a

pond, from typical convex to concave surfaces and very sharp edges, in a similar way to glass. The flints also contain small impurities in different proportions (for example, calcite, dolomite, ematite) that also result in the colors: white, grey, red, green, black, etc.

All these characteristics, including the great hardness (inferior in nature only to diamond, ruby and topaz), are the result of a complicated process of transformation of the amorphous silicates (deprived of crystalline structure) present in the calcareous layers. In them in fact enormous quantities of radiolari, are dissolved, dwarfish sea organisms whose skeleton are constituted of amorphous silicates, called opal.

This last, through a natural chemical process involves phases of dissolution and precipitation of the silicates, transformed into quartz that, migrating in the sediment, end up to be gathered in nodules and lenses of flint.

After well over 100 million years some flints (even splintered into manufactured articles in a prehistoric age) still show in the microscope, but also to the naked eye or in highlight, the minuscule flinty skeletons that have originated it.

The: Small prehistoric manufactured article ("pic"" of technique "campignana", around 2500 B.C.) from Quinzano.
1a. Tiny sea fossils (nummuliti) encased the splintered int.
1b: Possible spearhead in nose of the body of the manufactured article.

Nodules of flint exposed in the layers of the Biancone (Fornase Region of S. Mauro di Saline).

Marine microfossils (nummuliti) contained in the flint of a prehistoric manufactured article magnified 8 times) (Quinzano).

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