WASC 2294
WA1 G31

The Prehistory
of Gunpowder
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The Pre-history of Gunpowder

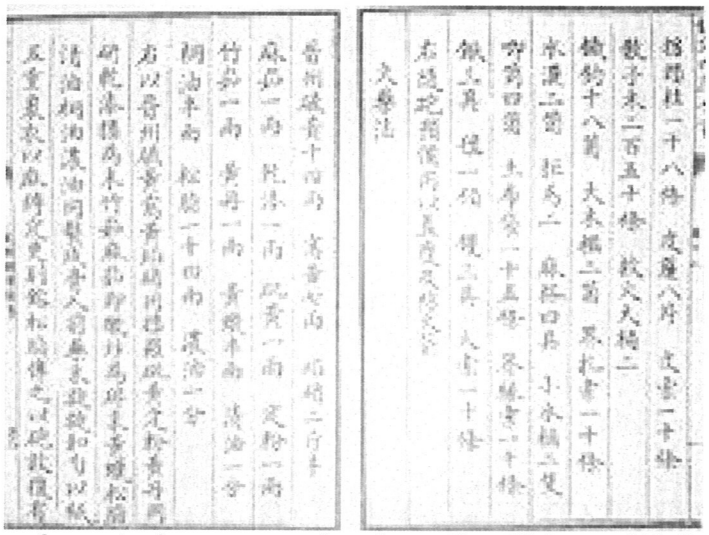
Much has been written on where and when gunpowder was first introduced. This paper offers a credible hypothesis to explain why and how the unique mixture may have come about.

Although it is now generally agreed that gunpowder originated in China in about the 9th C AD, few credible attempts have been made to explain its origins. Several individuals have been credited with the invention, particularly in medieval European texts; Berthold Schwarz of Freiburg, Roger Bacon,Tipsiles of Augsburg etc. but none were of the right era or location and some are probably legendary.

The birthplace of gunpowder has been claimed by Germany, Mongolia, India, even Sri Lanka[1] and others with varying credibility and little supporting evidence.

Muller[2] states that gunpowder was 'invented by King Vitty' who can be credibly identified as the Emperor Wu Ti 漢 武 帝 of the Han dynasty ruling 156-87 BC. Unfortunately, Muller does not elaborate or give the source of his assertion.

Needham has meticulously reviewed the early records including his unprecedented access to contemporary Chinese documentation and scholors at a time when few Western scholars could either visit China or had the necessary linguistic skills[3].



Earliest known written formula for gunpowder, from the Chinese Wujing Zongyao[4] of 1044 AD.

However, this still leaves open the question of how or why gunpowder first originated.

The eurocentric explanation tends towards a monk grinding the ingredients in a mortar and causing a spectacular explosion. A common candidate is Berthold Schwarz dated at late 14th C.

Apart from being discredited on grounds of date, gunpowder, although exremely sensitive to sparks, will withstand quite a lot of grinding without ignition[5] - and what prompted that particular mixture of ingredients?

Berthold Schwarz discovers gunpowder.

There is a Chinese tradition that a cook carrying a bowl of saltpetre slipped and dropped it onto a charcoal fire. That would certainly create a considerable conflagration but, as the ingredients were not mixed, hardly an explosion. We should also question what the cook was doing with the saltpetre. At that time it was an expensive comodity largely used in the extraction of metals but not common in Chinese cooking. Again, the presence of sulphur is not explained.

In the absence of documentory evidence, it is still possible to posit a credible sequence of events which will, perhaps, serve as a basis for debate.

Firstly, the term *Invention* is widely used but may be challenged. Invention infers a single innovative step. In the case of gunpowder, we have a mixture of the three well known ingredients, saltpetre, charcoal and sulphur. Even for the crudest early 'serpentine' powder the ratio of these is important. Although some latitude is permissable, outside certain limits the mixture is not viable. To arrive at a viable ratio of two elements by chance is unremarkable but for three the probability decreases rapidly. Serendipidy has its limits.

It should also be noted that although sulphur enhances certain properties, it is not essential and sulphurless gunpowder is well known. In particular, sulphur reduces the ignition temperature. The earliest gunpowder weapons were ignited with either a glowing ember or a red hot wire and sensitiveity was not an requirement until the introduction of the wheellock in about 1500. However, sulphur is common to all formulations in the earliest

records and there should be some explanation as to why.

Rather than an invention or discovery, it is proposed that gunpowder evolved by a logical sequence of developments each building on the materials and technology available at that time and place.

The following explanation is based solely on informed speculation but appears to fit the known facts.

Fire has been exploited by man since prehistoric times and appears in all known civilisations. The means of making fire varied with different cultures but, until the mid 18th C, it was universally a slow and laborious process. It is no surprise, therefore, that early man, particularly nomadic peoples, developed a simple means of transporting a small source of fire from which he could rapidly kindle a flame when needed[6]. This was the Firepot, a small clay pot holding glowing charcoal. At a time when fortifications were often a wooden stockade and roofs were thatched, it was an obvious ploy to lob firepots at your enemies defences[7]. It would have been suspended from leather thongs in normal use to avoid setting fire to adjacent materials and these provided a very effective means of throwing in the manner of a slingshot. An imprompu experiment indicates that a range of 30 yards or more was easily attainable at a first attempt with surprising accuracy.

Fire pot dated at c.5800BC and preserved in the Antalya museum which is close to the Adriatic end of the Silk Road.

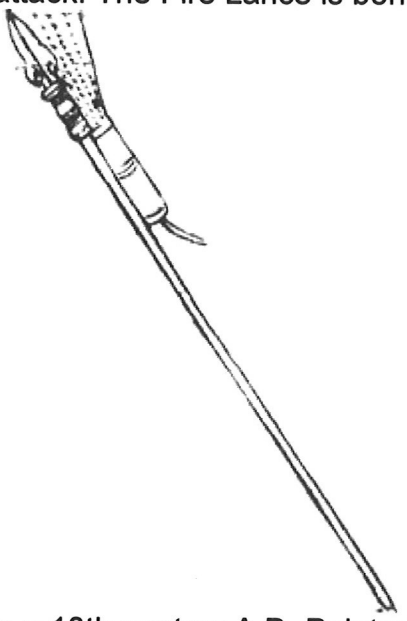
Man has always sought to exploit whatever is available in nature. In volcanic regeons it would be difficult to ignore the bright yellow rock brimstone or sulphur. To investigate its

use he would have applied the standard tests with which, even today, an practicing chemist would apply. Appearance; does it dissolve in water, taste and flamability? In this case the latter test produced a foul smelling and choking gas, an obvious way to improve your fire pot and bring further discomfort to your enemies. Thus was born the 'stink pot' which became very popular (with the thrower at least). It was particularly popular with the French and when *Temerare* fought *Redoubtable* at Trafalgar in1805 the former suffered considerable casualties from a stink pot which fell on her quarter deck[8].

The Chinese exploited fire in warfare and Sun Tzu devotes a chapter to it in his *Art of War* probably written c 400-200 BC. The Chinese were also exponents of the use of smokes for military, medicinal and religeous purposes and had access to native sulphur.

The discovery and investigation of saltpetre follows a similar course. A white powder found on stable walls which is soluble, has a sharp and identifiable taste and when thrown on fire causes it to flare up; another oportunity to improve the fire pot.

If we make the, not unreasonable, assumption that with bamboo, commonly used for containers might be used as a disposable fire pot, it becomes aparrent that, not only is the enhanced mixture not extinguished by being cut off from air, but it can eject flame for a considerable distance. This flaming tube be pointed or thrown at the enemy or be tied to a spear and used for defence or attack. The Fire Lance is born, the Huo Qiang[9].



Ho Quing from a 10th century A.D. Painted Silk Banner

Once this principle is discovered, the rest follows.

The tubes can be stockpiled and ignite easily. They are also far more portable than the roughly contemporary liquid 'Greek Fire'.

This early mixture with its un-optimised ratio of ingredients and consequent low power has been termed by Needham Proto Gunpowder but, once the potential was recognised, the incentive for further development is self evident.

As the weapon proved to be useful, the numbers made would increase and these would demonstrate the effects of altering the proportions of the mix, the purity of the ingredients, method of packing etc.
The more saltpetre, the further the flame – and it generates a force that pushes the lance

back! Reverse the tube and we have a rocket.

A little sand or grit in the mix is ejected red hot and further discomforts the enemy. If a piece of grit is large enough to nearly fill the bore, it can be thrown a considerable distance. Thus we have the origins of a gun, needing only the introduction of the breech end touch hole[10] to complete the basic design, the long established Chinese expertise in bronze casting supplying a stronger and re-usable barrel.

Finally, crude ingredients produce significant slag when they burn. Inevitibly an occasional tube would become blocked causing an explosion and we have the idea of a bomb.

Again, a packed tube of gunpowder is observed to burn at a predictable rate and near impossible to extinguish – obvious ancestors of the fuse and portfire.

At each stage of development all that is necessary is to observe and apply the lessons learned.

Of course considerable development work remained. Early gunpowder was low in saltpetre and consequently had little power by modern standards, what Needham terms proto-gunpowder. Nevertheless all the basic ingredients were present and in proportions which demonstrated the potential. All further work was simply incremental refinement of these principles driven by the needs of warfare. The critical factor is the availability of saltpetre. This was long imported into medieval Europe along the Silk Road under the name of 'Chinese Snow' which infers that country as the major source. With increased demand sources of supply were developed, allowing the formulation to be empirically optimised to near modern proportions by about mid 14th C.

It is well known that early gunpowder was a simple mechanical mixture which was liable to seperate in transit and prone to absorb moisture. The latter would inevitably cause lumps powder. It is suggested that a 15th C gunner in a hurry failed to crush his lumpy powder and loaded the grainy mix. The increase in power would have been evident and, if he and the gun survived the experience the potential improvement was noted. At the same time eliminating the propensity of the ingredients to seperate in transitThe production of 'corned' powder became standard practice until superceded by grained powder during the Industrial revolution.

No great innovative step is required at any stage and, where the ingredients were available, the process seems almost inevitable.

Although gunpowder was first recorded about 1044AD, its origins appear to be much earlier and lost in the mists of time. Evolution of known technologies appears to offer a more probable mechanism than a single inventive event.

In the absence of any positive evidence, the sequence described above appears to be a reasonable explanation for its conception and its adaption to a series of weapons which are still readily recognisable today.

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April 2012

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1 http://www.lankalibrary.com/phpBB/viewtopic.php?t=3157
2 Muller John, A Treatise of Artillery 1780

3 Science and Civilisation in China , Military Technology; The Gunpowder Epic Vol 5 Cambridge University Press 1986
4 http://en.wikipedia.org/wiki/Wujing_Zongyao
5 Early gunpowder was commonly incorporated in stamp mills – an industrial scale pestal and mortar.
6 The practice survived until comparatively recent times. In the Jungle Book, Mougii steals burning charcoal in a wicker basket lined with clay. See also Genesis 15, 12 for possibly the first written record.
7 Mentioned as used in a raid on the Sarawack pirates by Brooke's Batang Lupar Expedition in 1844
8 The CS grenade is the modern descendent.
9 The first reliable record of a fire lance in battle was during the siege of De An in A.D. 1127-1132. as reported by Chen Gui, co-author together with Tang Shou, of the military manual Shoucheng lu or "Defense of Towns".
10 The introduction of the touch hole can be considered as a truely inventive step.