



Technology and war

An Historical Perspective

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Rivoluzione

«The military art has been changed by the invention of gunpowder, which enables man to command the two most powerful agents of nature: air and fire. Mathematics, chemistry, mechanics, architecture, have been applied to the service of war, and the adverse parties oppose to each other the most elaborate modes of attack and defense. Cannon and fortification now form an impregnable barrier against the Tartar horse, and Europe is secure from any future irruption of barbarians since, before they can conquer, they must cease to be barbarians».

Edward Gibbon: Decline and Fall of the Roman Empire, 1776-1789, cap. 39

«In modern war the great expense of firearms gives an evident advantage to the nation which can best afford that expense, and consequently to an opulent and civilised over a poor and barbarous nation. In ancient times the opulent and civilised found it difficult to defend themselves against the poor and barbarous nations. In modern times the poor and barbarous find it difficult to defend themselves against the opulent and civilised».

Adam Smith, Wealth of Nations. Book 5 chap. I

Myths about gunpowder

- **Invented in China but developed in Europe thanks to better technological base**
- **It has had a revolutionary impact within Europe, making knights obsolete**
- **It has had a revolutionary impact in the world, allowing European dominance**

Lessons from gunpowder

- **Europe not first, and not the only one**
- **Profound impact, but not revolutionary, since it has taken centuries (maturity only in XVII Century)**
- **End of knights even before (infantry revolution of XV Century)**
- **European dominance even before (XVI Century)**

General lessons

- **More than its invention, the crucial element is its application, which requires particular social contexts. There is no silver bullet**
- **Proliferation is very easy if context is compatible, otherwise useless**
- **Interaction between social and technological context is complex, and often unpredictable**

Weberian view

The conflict between discipline and individual charisma has been full of vicissitudes. [...] Yet, just as in the Middle Ages gun powder can scarcely be said to have brought about the transition from undisciplined to disciplined fighting, so iron as such did not bring about the change; after all, long-range and knightly weapons were also made of iron. It was the discipline of the heavily armed Hellenic and Roman foot-soldiers [hoplites] which brought about the change. [...]

It is evident that the kind of weapon has been the result and not the cause of discipline. [...]

At the close of the Middle Ages it was the massed force of the Swiss, with its parallel and ensuing developments, which first broke the monopoly of knighthood to wage war. [...]

It was discipline and not gun powder which initiated the transformation of warfare. [...]

An all-round weakening of discipline--but varying greatly in degree --usually accompanies any kind of decentralized military establishment, whether it is prebendal or feudal. [...] all of these were stages of the economic decentralization which usually goes hand in hand with the weakening of discipline and the rise of individual heroism. From the disciplinary aspect, just as from the economic, the seigneurial vassal represents an extreme contrast to the patrimonial or bureaucratic soldier.

Max Weber: Economy and Society

Sung Dynasty, X Century

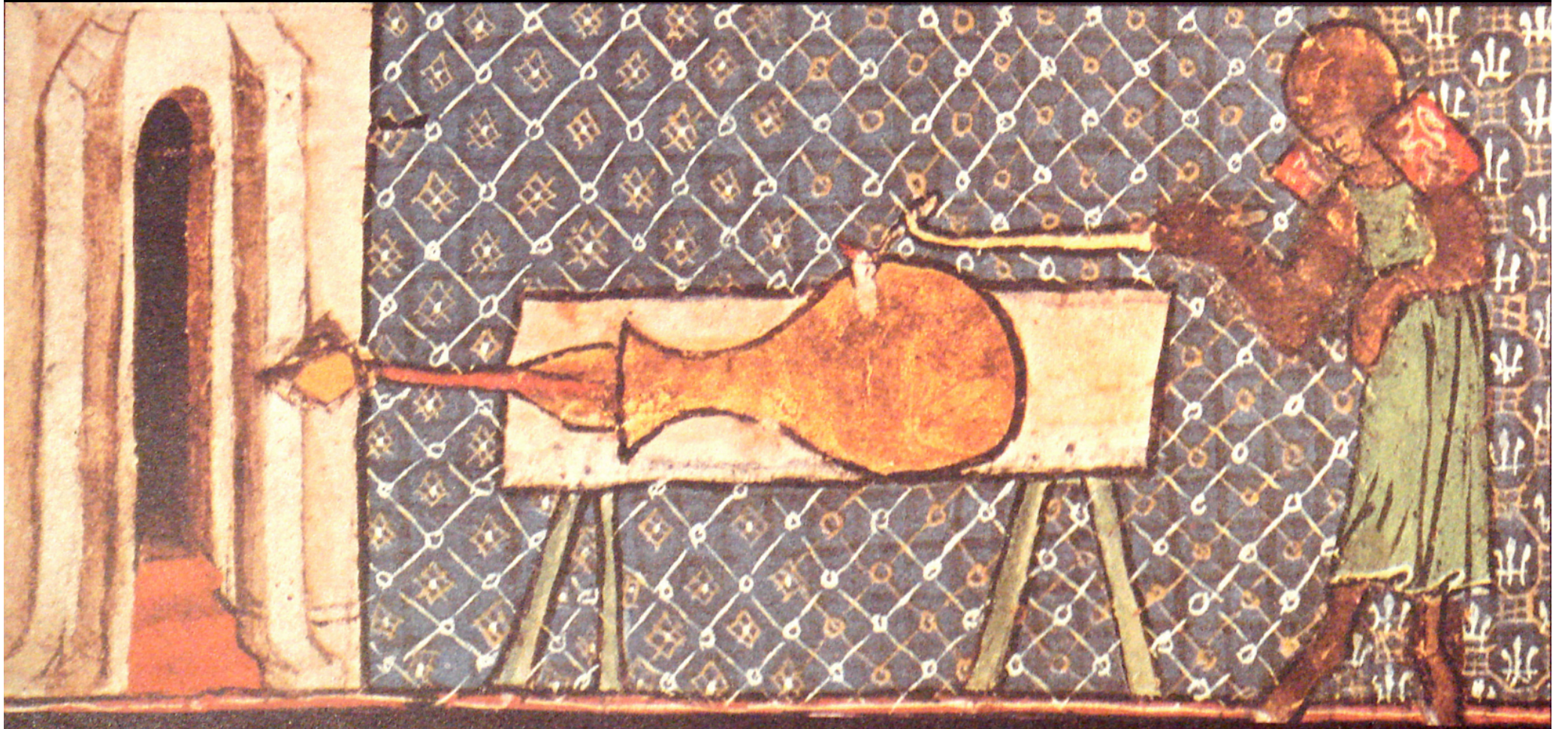


Mongol Empire



Mongol Empire

- **arrives in Europe in 1242-1243**
- **brings gunpowder**
- **brings eurasian political unity which allows pax mongolica and silk routes**
- **brings crisis in Islam, Europe's closest competitor (Prester John)**
- **brings Black Death (1348-1350) which favours Renaissance**



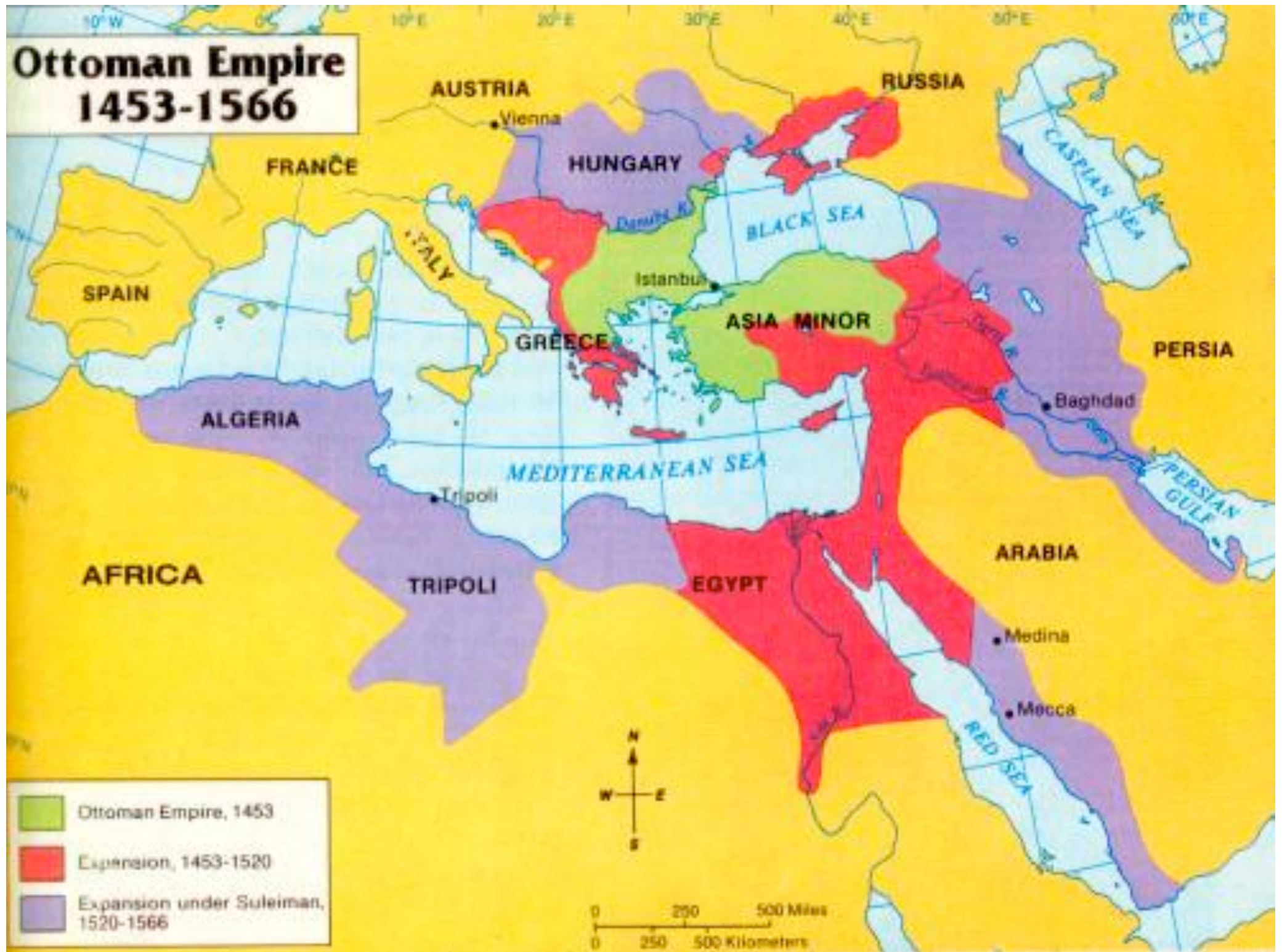
De Nobilitatibus Sapientii Et Prudentiis Regum, 1326

Gunpowder empires

Big changes outside Europe first

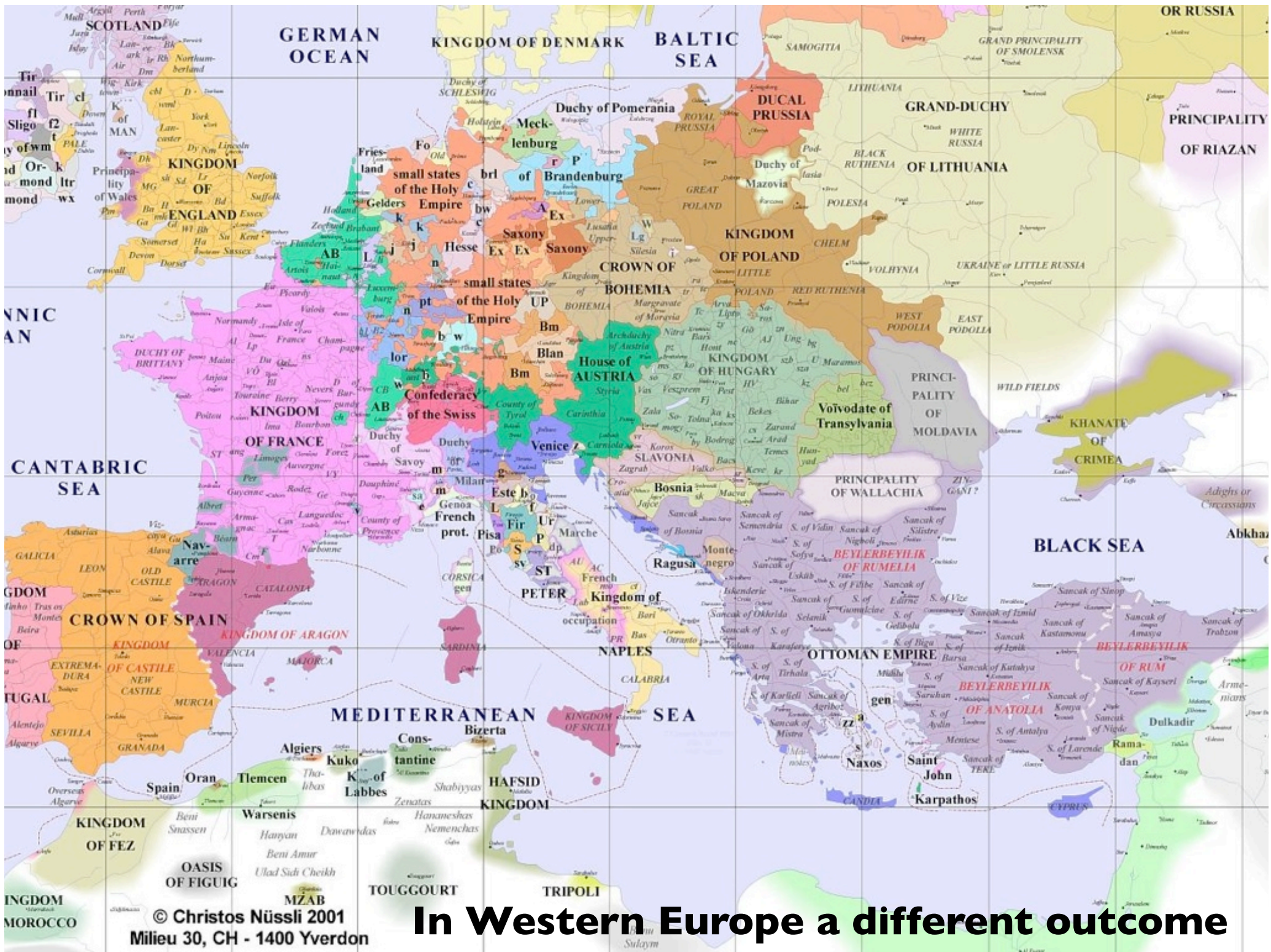
- **Ming Dynasty (1368-1644)**
- **Mughal Empire (1526)**
- **Safavid Empire (1501)**
- **Ottoman Empire (1453)**

Ottoman Empire 1453-1566



Suliman at the gates of Vienna (1529)





© Christos Nüssli 2001
Milieu 30, CH - 1400 Yverdon

In Western Europe a different outcome

Impact of gunpowder

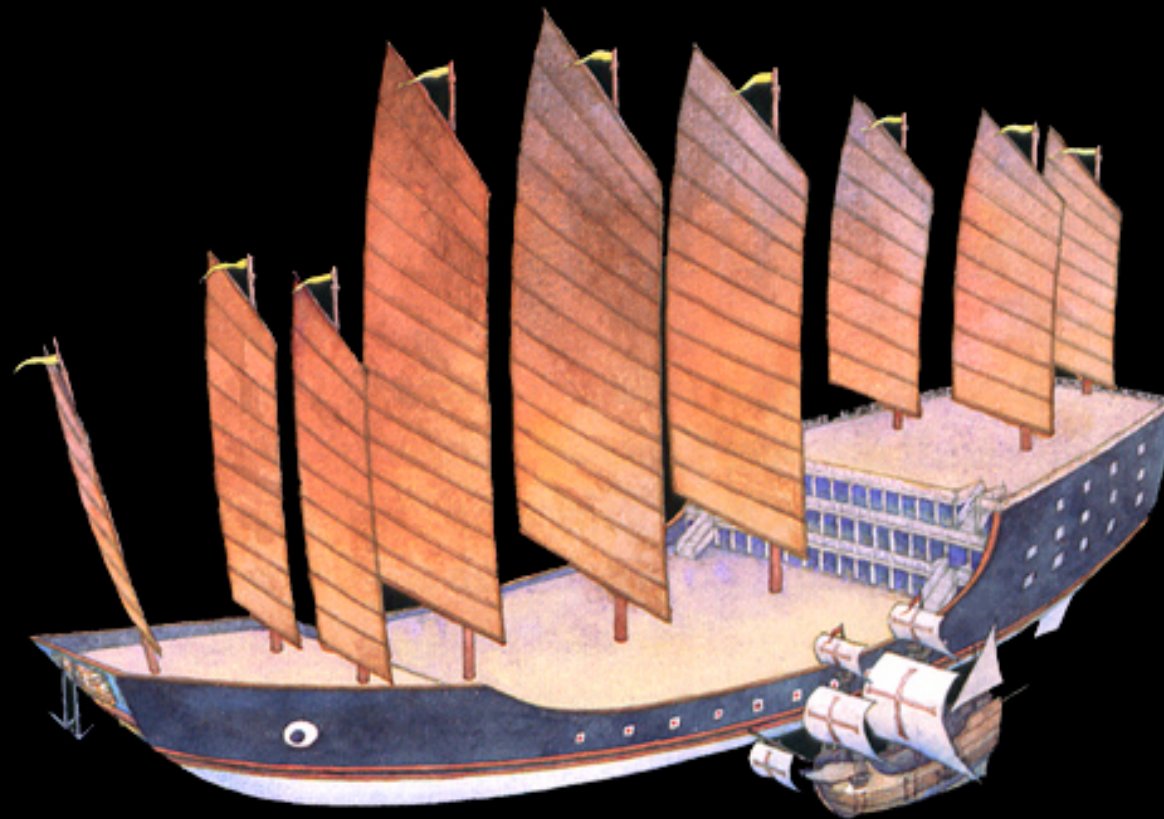
- **In Americas quite strong, due to monopoly**
- **In Asia not so much. On land Europe actually inferior in XVI compared to Ottomans**
- **Real difference was initially in naval warfare, due to completely accidental differences in design**
- **Long term difference was in siege warfare, which sparked Absolutism, but a paradoxical effect**
- **Land warfare last, and adaptation sparked by organization more than by technology**



New World

Messico (1519-21) Cortes (600 uomini e 16 cavalli), Perù (1531-33) Pizarro (100 uomini e 37 cavalli)

germi più importanti di cavalli, cavalli più importanti di polvere da sparo, determinazione e ferocia più importante di tutti



A MING TREASURE SHIP
Perhaps 400 ft (122 m) long,
170 ft (52 m) wide

**VASCO DA GAMA'S
SÃO GABRIEL**
About 74 ft (23 m) long,
18 ft (5 m) wide

ocean going ships



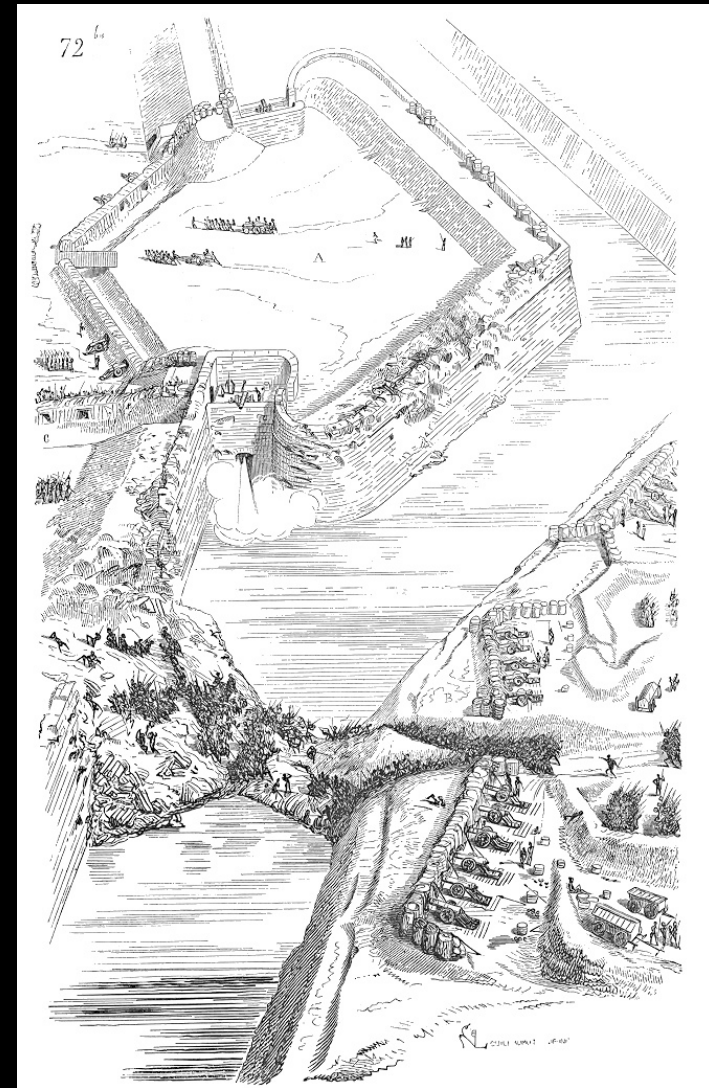
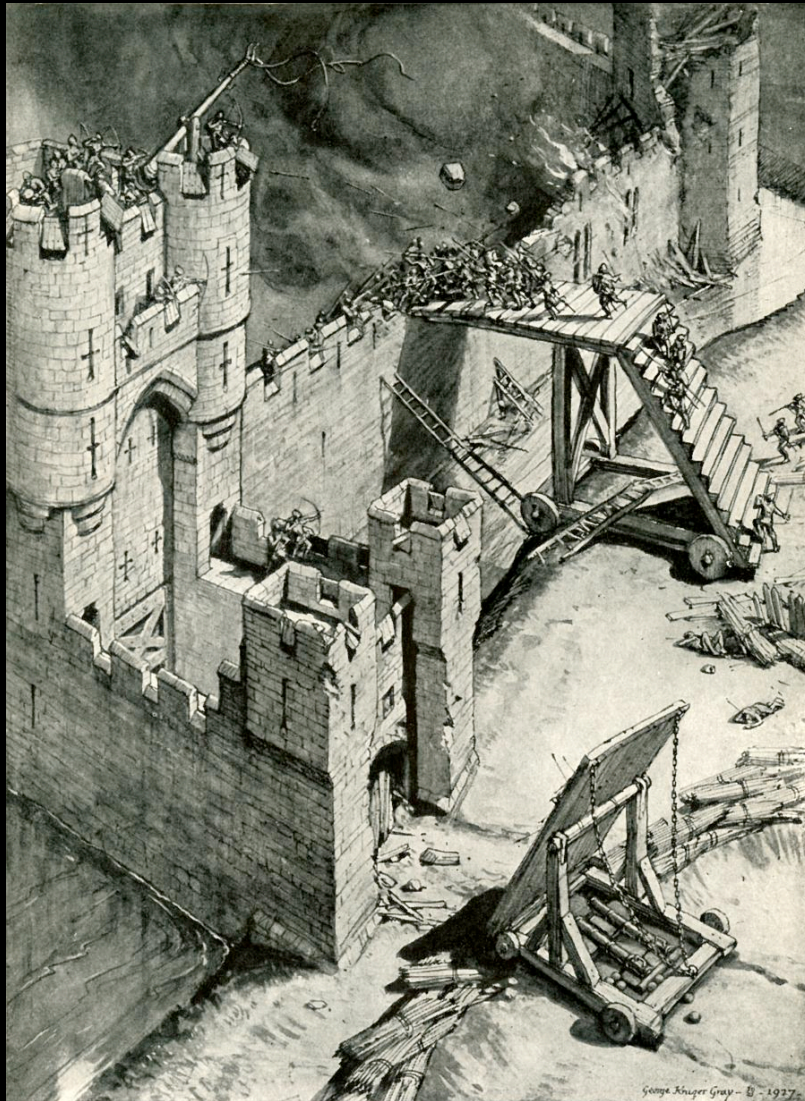
1. Long open sea routes
2. Capable of resisting Atlantic storms
3. Sufficiently sturdy and stable so as to carry cannons

Portuguese ambitions



Planisfero di Cantino (1502)

Siege warfare

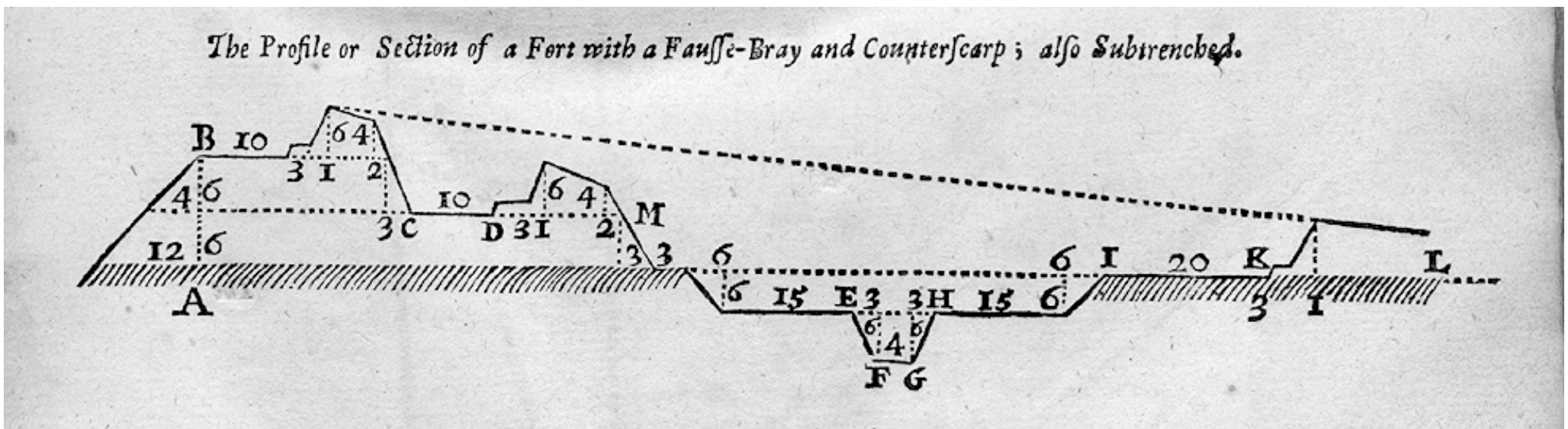


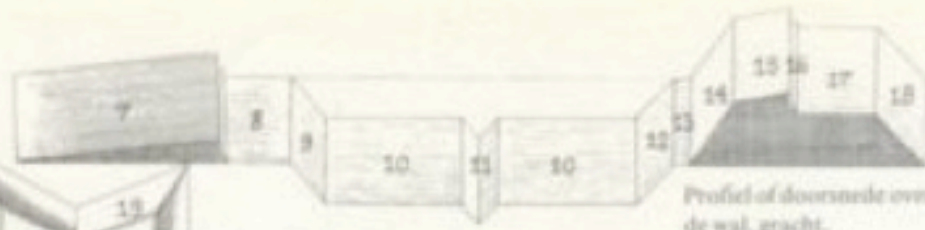


Trace Italienne
 Artillery or polygonal fortresses

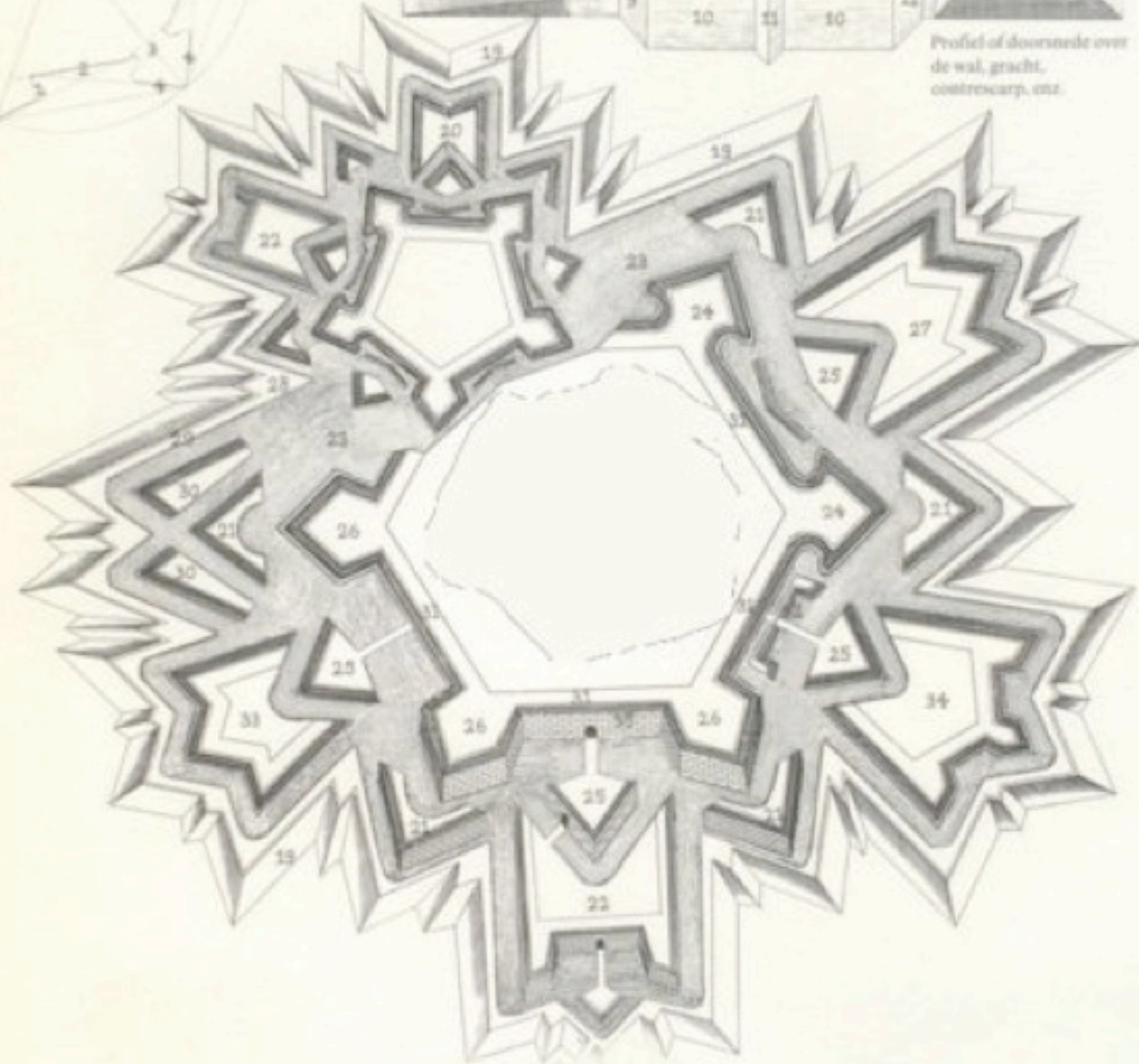
Virtually impregnable

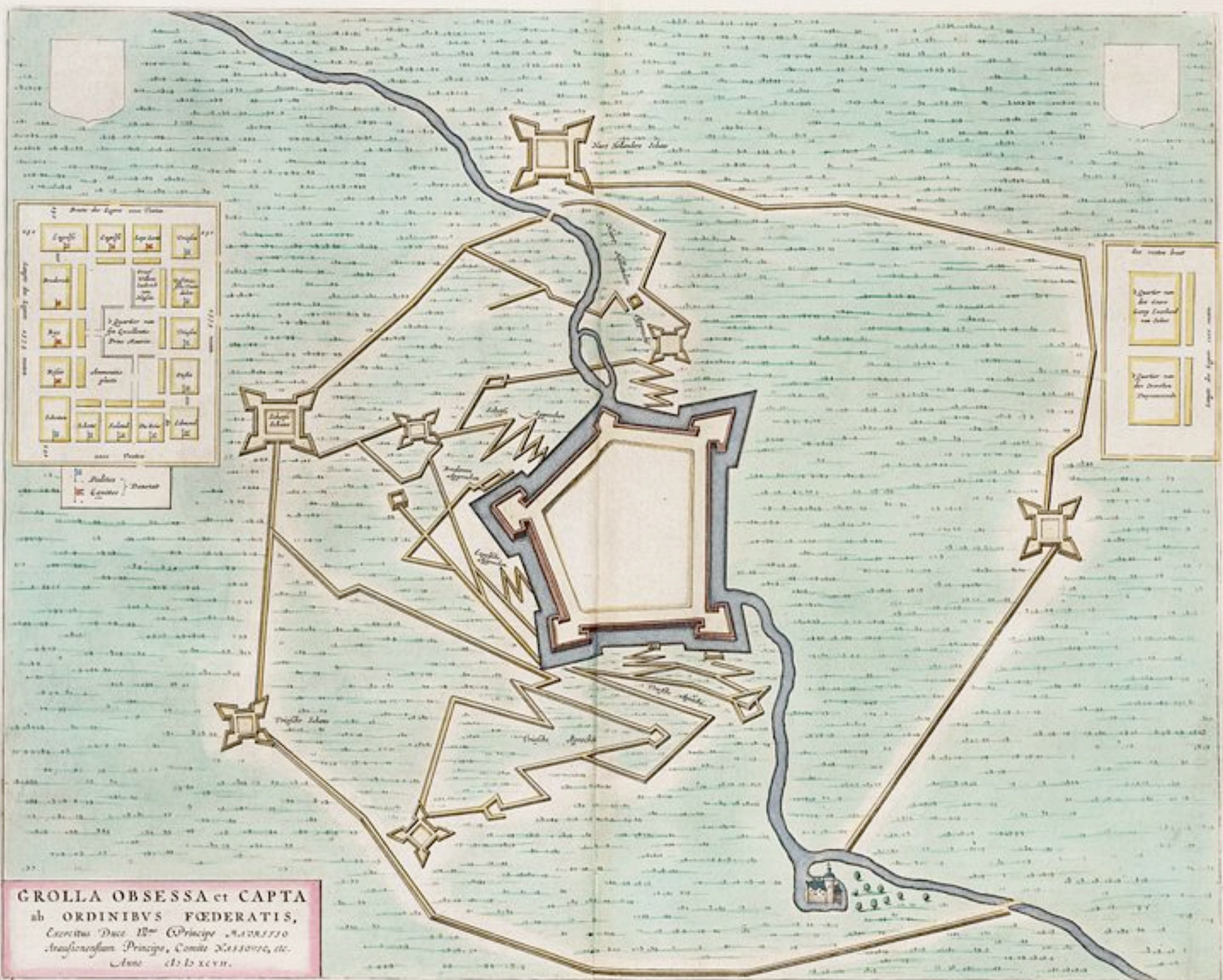
High and rising costs





Profiel of doorsnede over
de wal, gracht,
contrescarp, enz.





PLAN DE LA VILLE DE
NEW AMSTERDAM
EN 1674



Land Warfare

- **Firearms less rapid and precise than bow and arrow until end of XVIII Century. But easier to train**
- **For two centuries mixture of pike and shot, to defend from cavalry, until bayonet**
- **Key was skill, not technology**
- **Superiority given to drill (and from Napoleon to motivation)**
- **Measured by declining depth of formations, which made more efficient use of arms**



Il tercio



Scena del film: Il destino di un guerriero (Alatrisme, 2006)

The Order of

The order of a square battaile, impayled with wings
and troupes of shette, as in the fieide is vsed in
these dayes.

Loose shotte.

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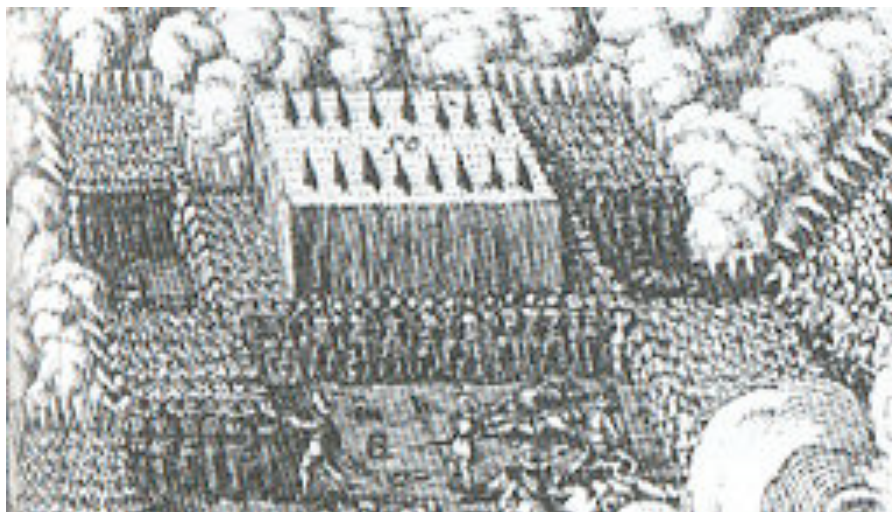
Rereward

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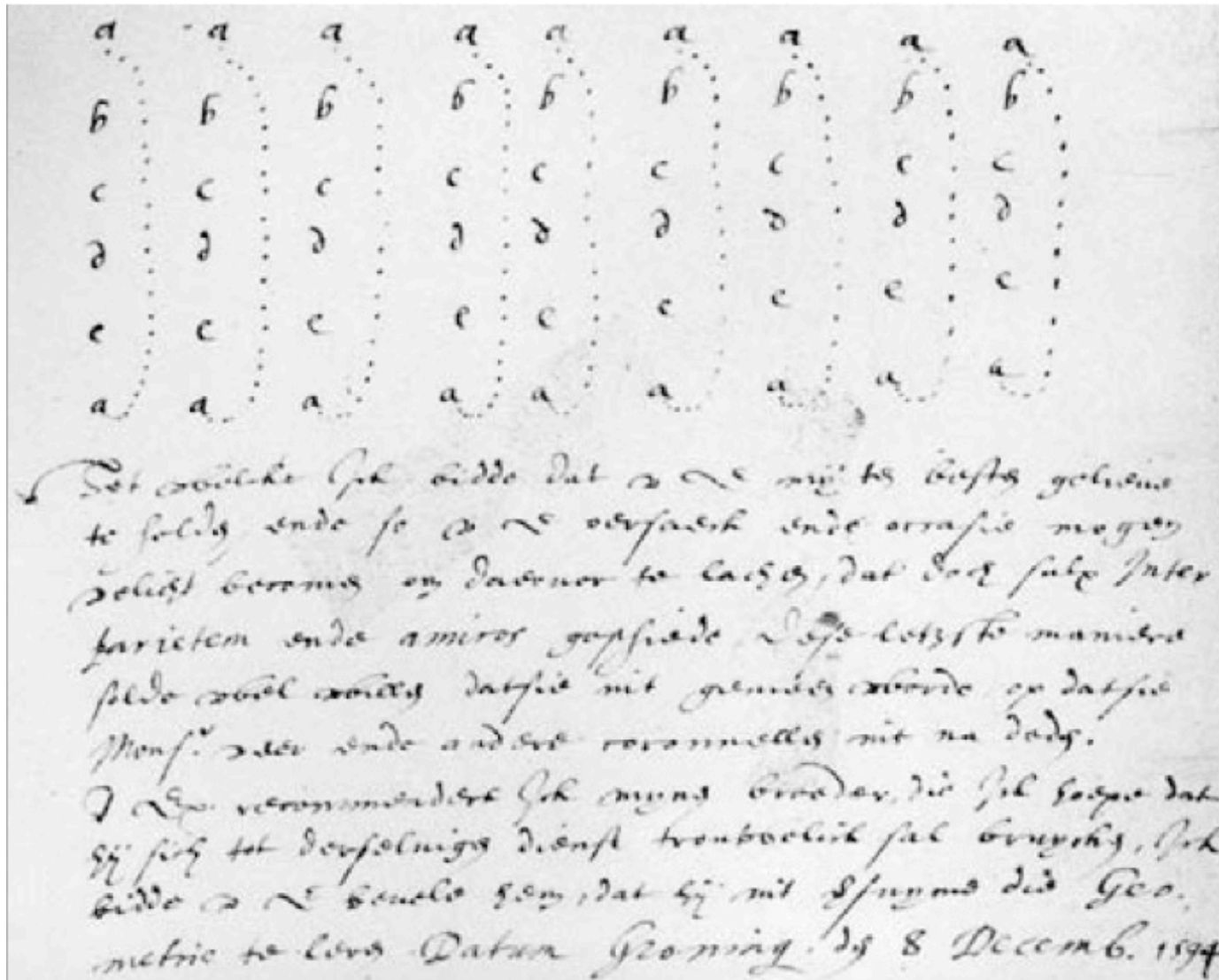
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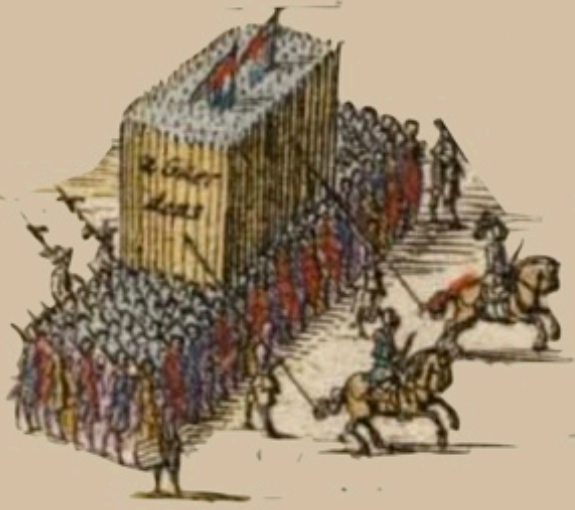
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pike squares
surrounded by shot

Maurice of Orange and the volley

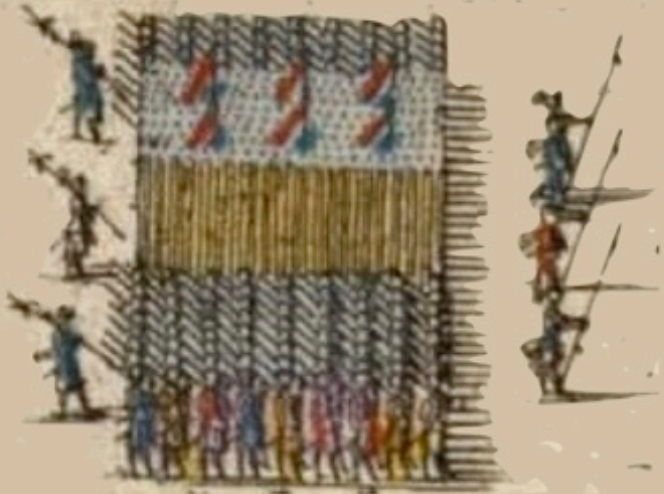




Muskettiers

Arquebuziers

L'Admirant
d'Arragon

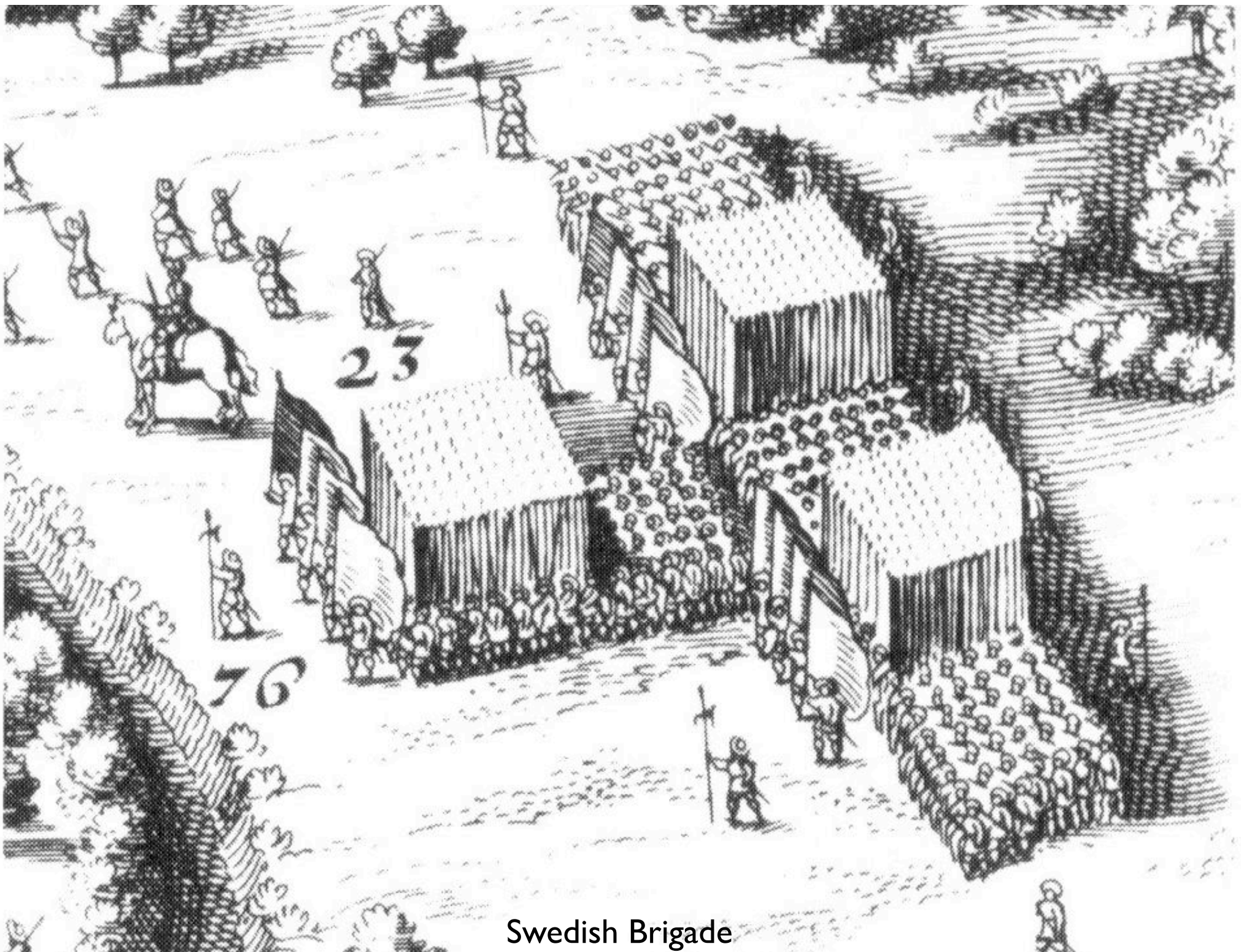


Muskettiers

Arquebuziers



Bataillon
toutes nations



Swedish Brigade

France.



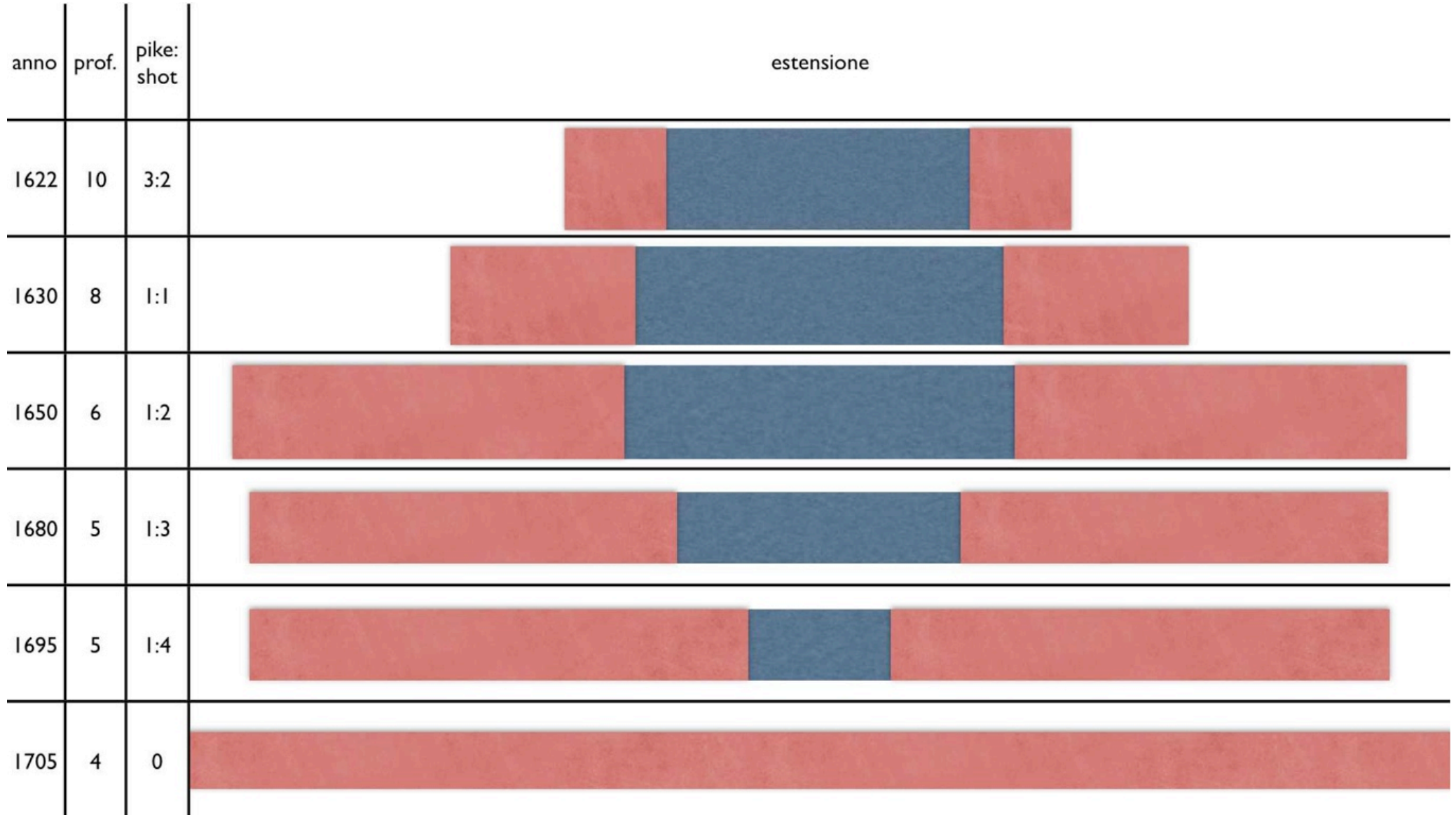
Officiers.

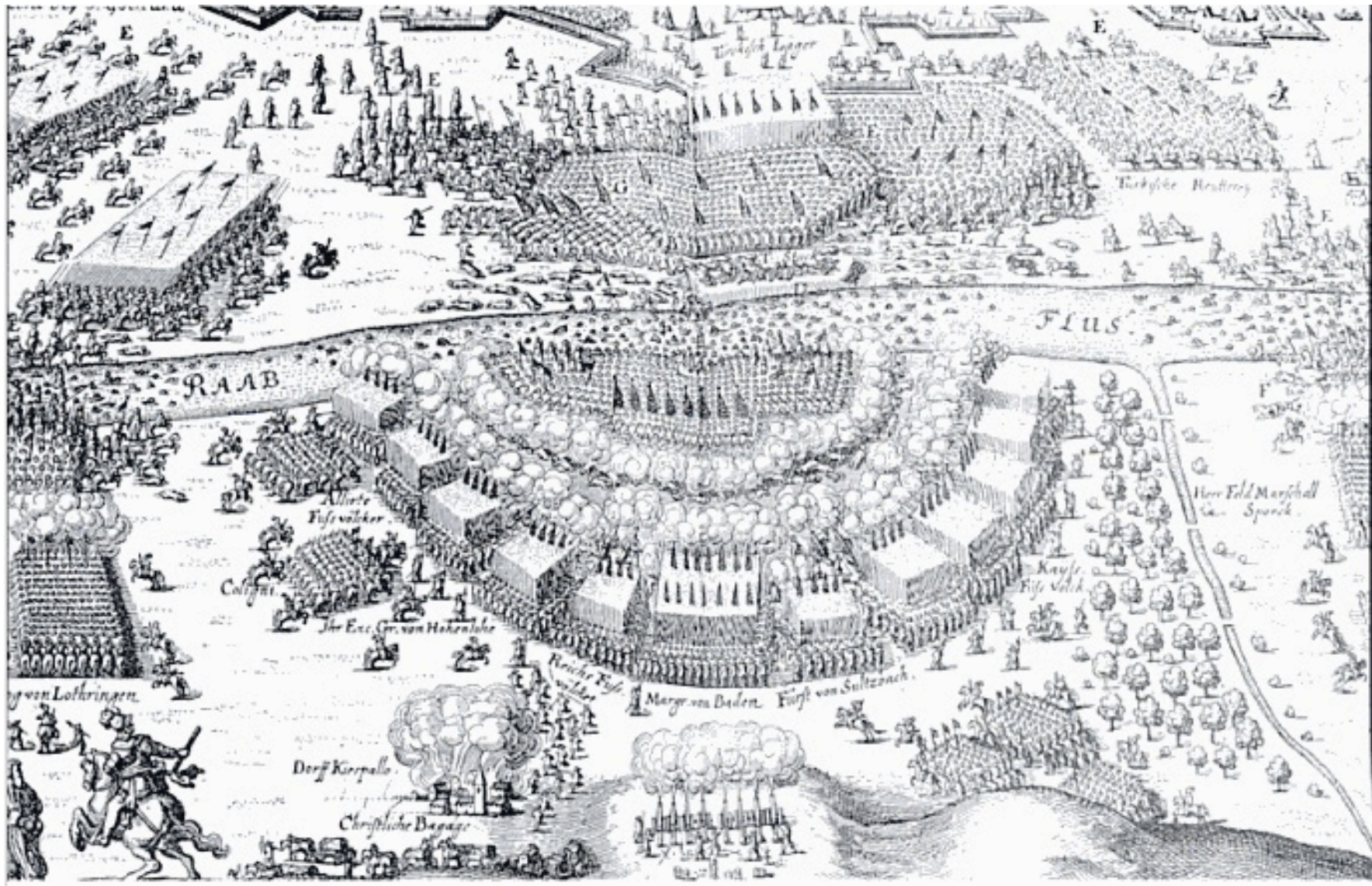
Gardes françaises.

1697.

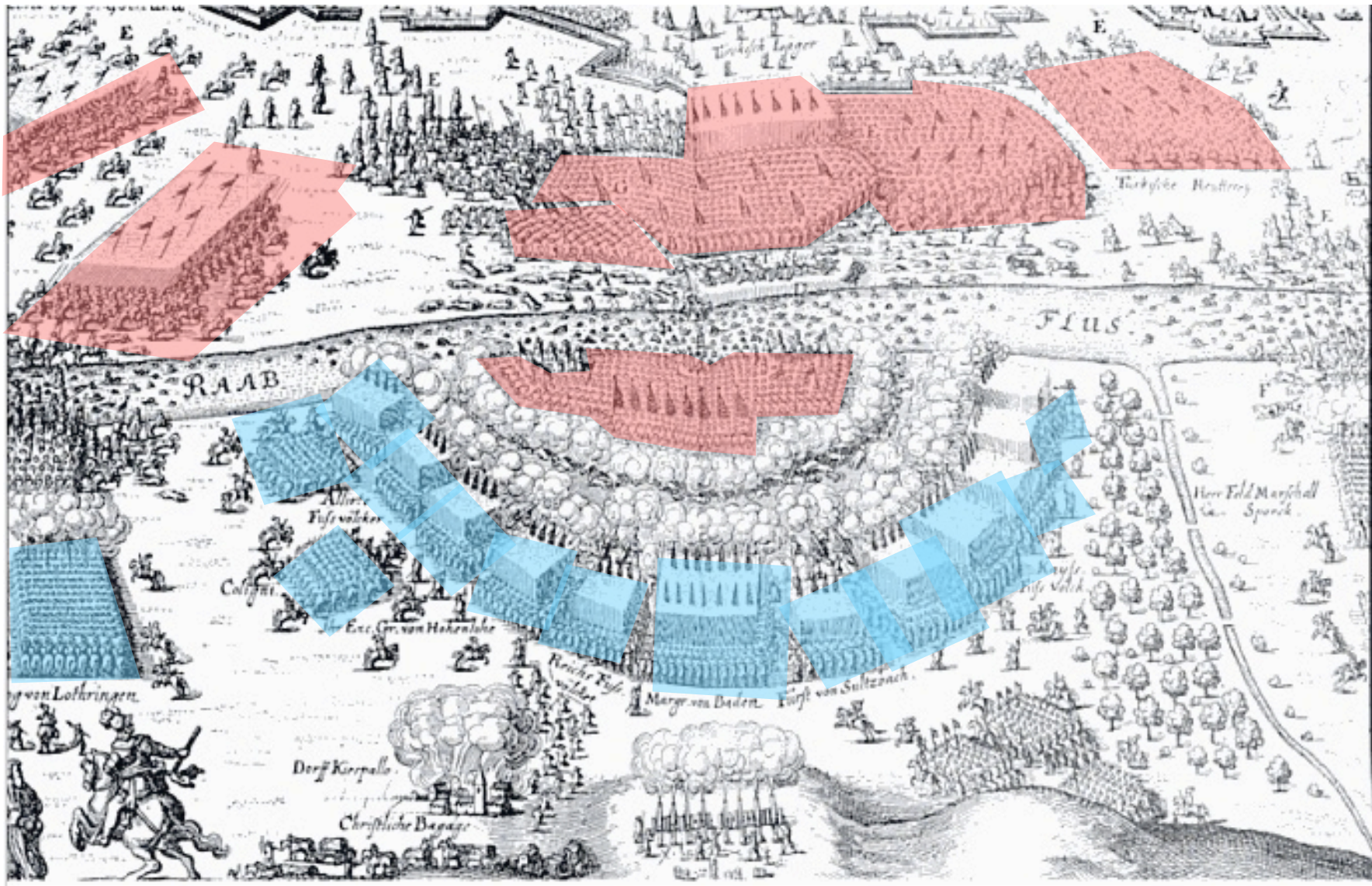
Les officiers portaient à cette époque les mêmes couleurs d'uniforme que la troupe; mais l'ornementation de l'habit à l'aide de galons, de boutades etc., était entièrement laissée au goût de chacun. C'est à dessein que, par les nombreuses sources dont nous disposons, nous avons choisi et juxtaposé des uniformes très distincts les uns des autres. La question „uniforme“ ne s'appliquait donc, en ce qui concernait les officiers, qu'aux couleurs. L'esponton avait une forme des plus simples.

Battaglioni francesi nel XVII secolo





San Gottardo 1664



San Gattardo 1664