

Fortification and geometry in the 17th century: a military and mathematical revolution

Frédéric Metin

Université de Bourgogne, France

frederic.metin01@u-bourgogne.fr

Abstract

Purpose

This workshop will first give the participants a view on modern military architecture in the period following the invention of powder and use of metal cannonballs. After the French Italian wars (end of the 15th century), the architects tried to reply to the power of cannons by creating new shapes taking into account the straight lines of the cannonballs trajectories. Their main invention was the bastion, a pentagonal building to be placed at the vertices of the polygonal enclosures of the cities. But what size and angles were they to be given?

Different models were invented by a variety of authors, from captains to geometers, but none of them gave real reasons for their constructions and chosen shapes: in the majority of the cases, the construction algorithms are given without explanations, the size and angles being hardly computed and justified.

One of the first authors to give mathematical proofs was Jean Errard de Bar-le-Duc, a military engineer of King Henry IV of France, in his book *La Fortification reduicte en art et demonstrée*, published in 1600 at the king's request.

The works of Errard were probably well received in the Low Countries, where they generated a new manner of fortification. After Simon Stevin's own treatise, several authors linked to the Leiden school of engineers published books which gave a large part to mathematics.

Samuel Marolois was the first to explain how one can use trigonometry to compute the distance and prove the shapes to be fitted for defense.

Later in the century, fortification was studied as a part of the mathematics course in Jesuit colleges as well as in private lessons taught to young noblemen who had to gain abilities in the sciences of war.

In the second part of the workshop, the participants will be invited to study original texts and reproduce the methods of drawing a fortress of the 17th century. Moreover, they will make sense of Marolois's trigonometric computations.

The main question we will try to answer is: what was the use of mathematics for creating the geometrical shapes of modern fortresses, and for investigating them?

Original texts proposed to study

Anonymous (ms), *Recueil en italien de dessins de fortification*, end of the 16th century: Biblioteka Jagiellońska, Krakow, Poland.

Coignet, Michel (ms), *Recueil de traités mathématiques: Des Tables de Sinus, Tangentes, Sécantes, etc. Des Triangles plans...*, 1612: Bruxelles, KBR.

Errard, Jean, *La fortification reduicte en art et demonstrée*: Paris, s.n., 1600

Marolois, Samuel, *Fortification ou architecture militaire tant offensive que deffensive, suputee & dessignée par Samuel Marolois*: The Hague, Hendrik Hondius, 1615.

Rohault, Jacques, *OEuvres posthumes de Monsieur Rohault*: Paris, Guillaume Desprez, 1682

Scala, Giovanni, *Delle fortificationi di Giovañi Sala Mathematico. Libro primo. Al Christianissimo Re di Francia e di Navarra Henrico IIII*: Roma, s.n., 1596

Remark (by the Organizers): Additional material has already been uploaded on the ESU-8 website.
