

Felix Klein (1849-1925)

Erlanger Programm (1872)

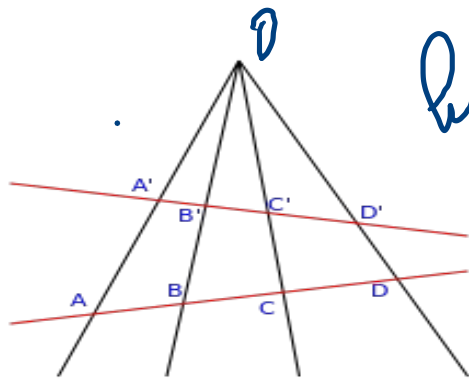
(conférence inaugurale)

Über die sogenannte Nicht-Euklidische Geometrie
(1871, 1873)

Géométrie projective

La théorie de perspective

- Euclide, l'Optique
- (1591-1661, Lyon)
- Girard Desargues, Briouillon de Projet (1639)



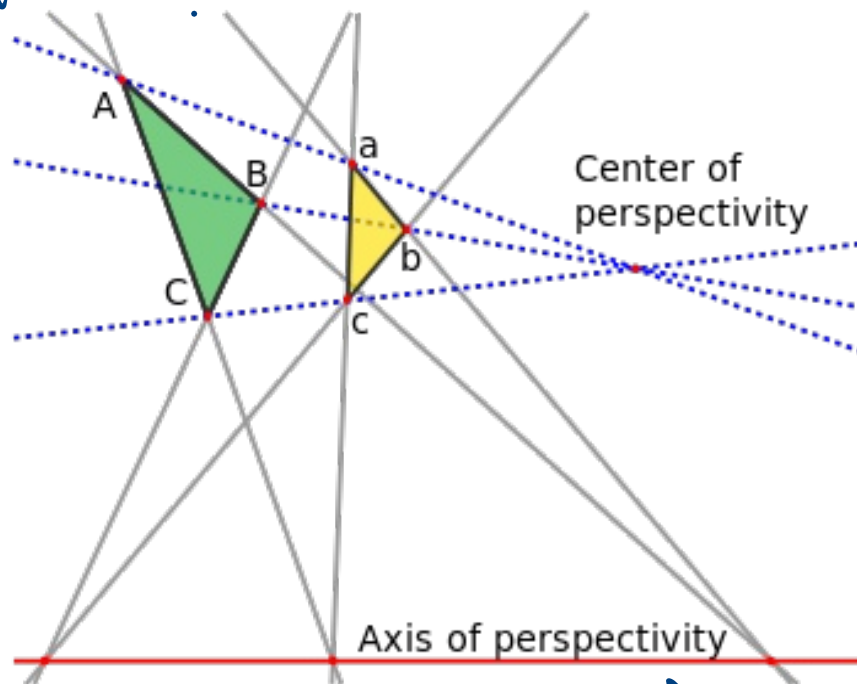
le rapport

(cross ratio)

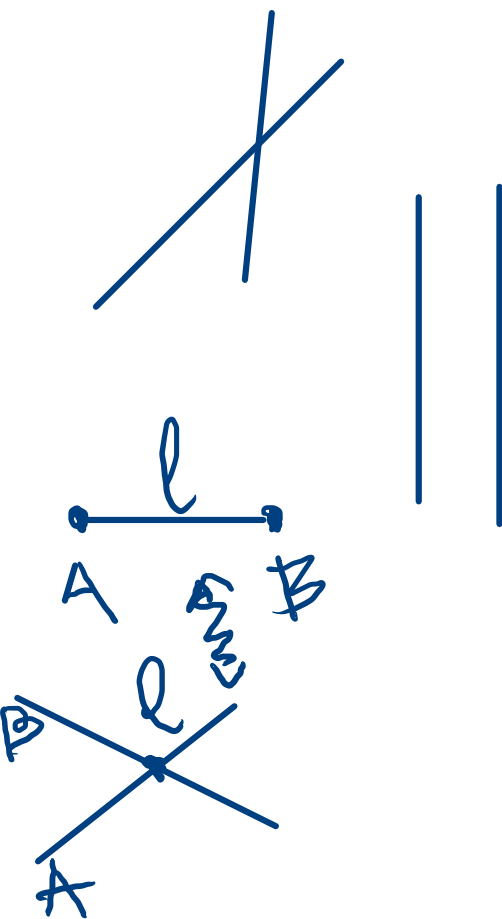
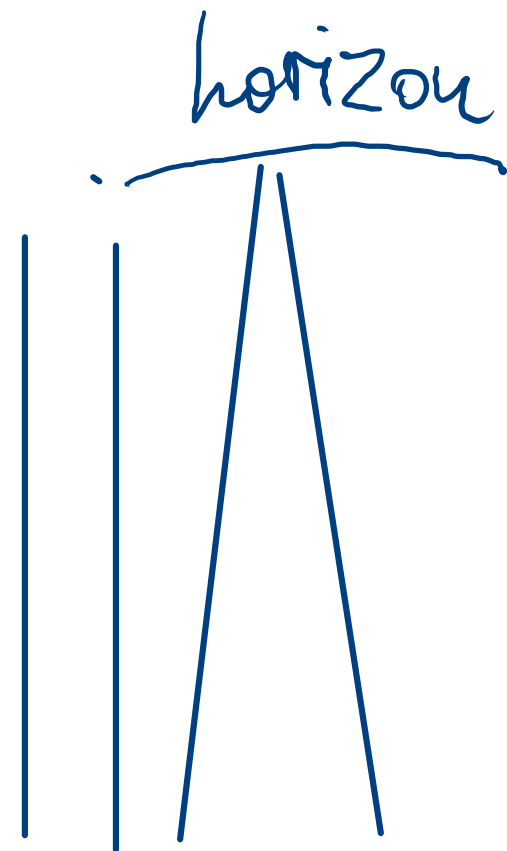
$$(A, B, C, D) = \frac{AC}{BC} : \frac{AD}{BD} = \frac{AC \cdot BD}{BC \cdot AD}$$

Analité
projective

Theorème de Desargues
point $\leftrightarrow$ droites



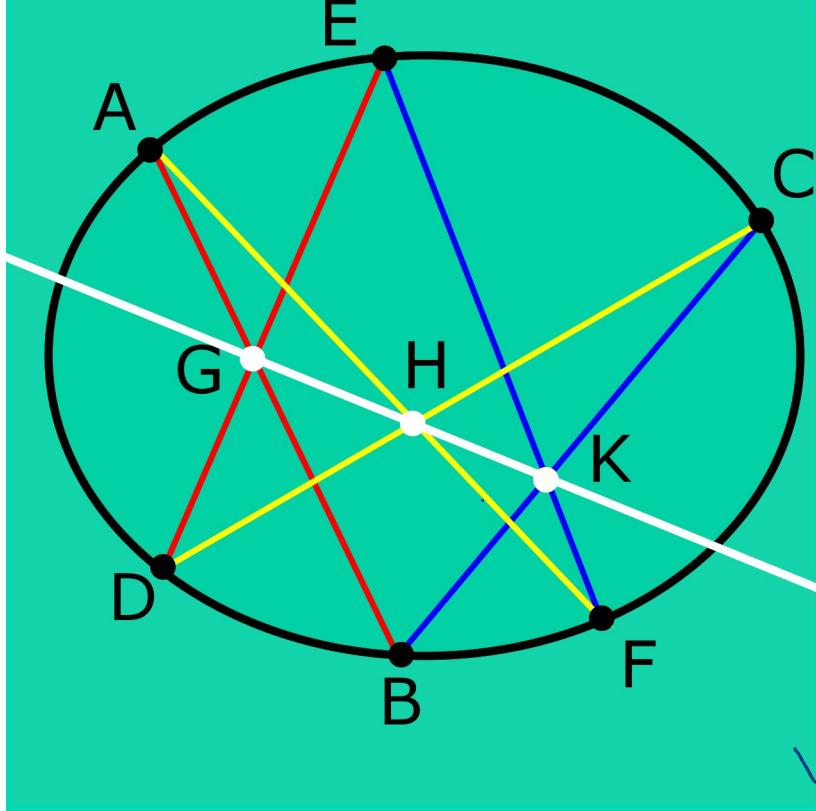
[plan projective]

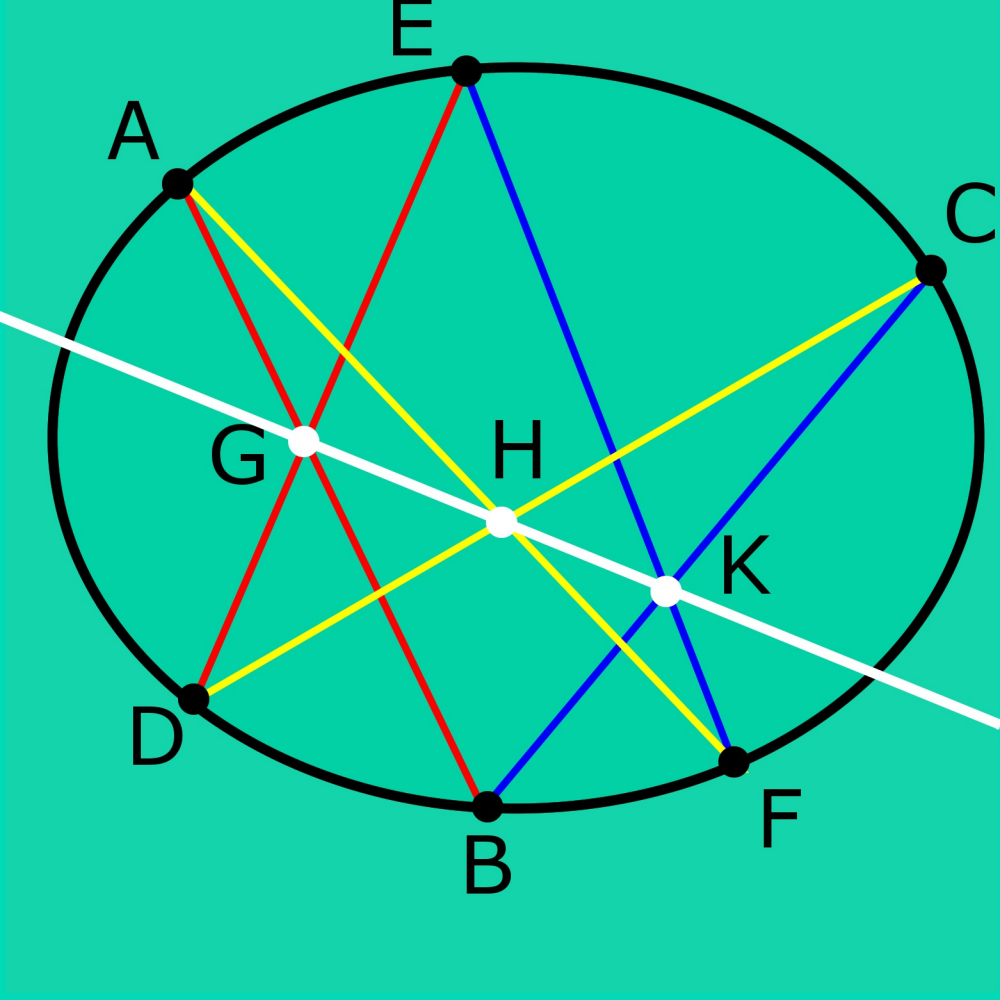


Blaise Pascal (1623-1662)

Théorème de Pascal

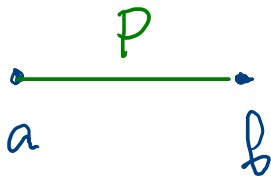
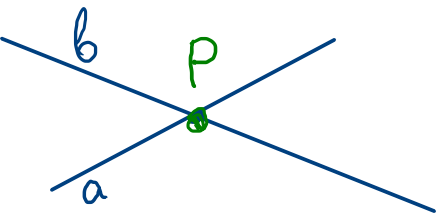
voir →

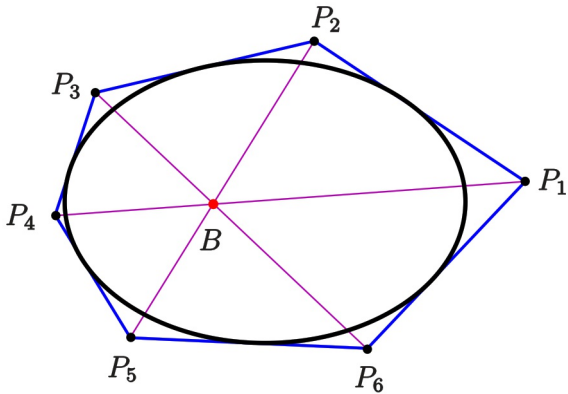




Théorème Dual (Brianchon)

points $\longleftrightarrow$ droite





Jean-Victor Poncelet (1788-1867), né à Metz

Traité des propriétés projectives des figures

(1822, écrit à Saratov, Russie)

Joseph Diaz Gergonne (1771-1859), né à Nancy

Arthur Cayley (1794-1875)
Theorie de groups (1854)

Evariste Galois (1811-1832)

$(\textcircled{x^5 + bx^4 + cx^3 + dx^2 + ex + e = 0})$

$(\textcircled{\begin{matrix} a & b & c & d & e \\ e & d & c & b & a \end{matrix}}) \cdot \underline{\underline{S_5}}$

Note on Lobachevsky's
Imaginary geometry
(1865)

On the non-Eucl.
geometry (1872)

$\begin{matrix} a+b & a+0=0+9=9 \\ (-b)+b & =b+(-b)=0 \end{matrix}$



Klein 1871-1873:

 Geom. projective + une métrique de courbure constante

Cayley: une structure projective sans une métrique!



(i)

Klein - (re)unification de géométrie!

$C > 0$ réel: $d(A, B) = \sqrt{C} \ln(A, B, P, Q)$ (birapport)

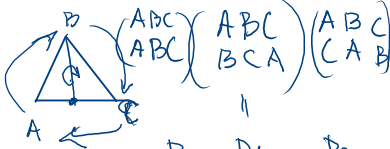
le cas hyperbolique

C - imaginaire

le cas elliptique,

$\frac{1}{2}, -1$

$$\begin{pmatrix} A & B & C \\ C & B & A \end{pmatrix}$$



$$\underline{|PR| = |PR'|}$$

$$P_0 \quad P_1 \quad P_2$$

$$P_1^2 = P_2$$

$$P_1^3 = P_0 \quad P_2^2 = P_1$$