

Huygens's Principles

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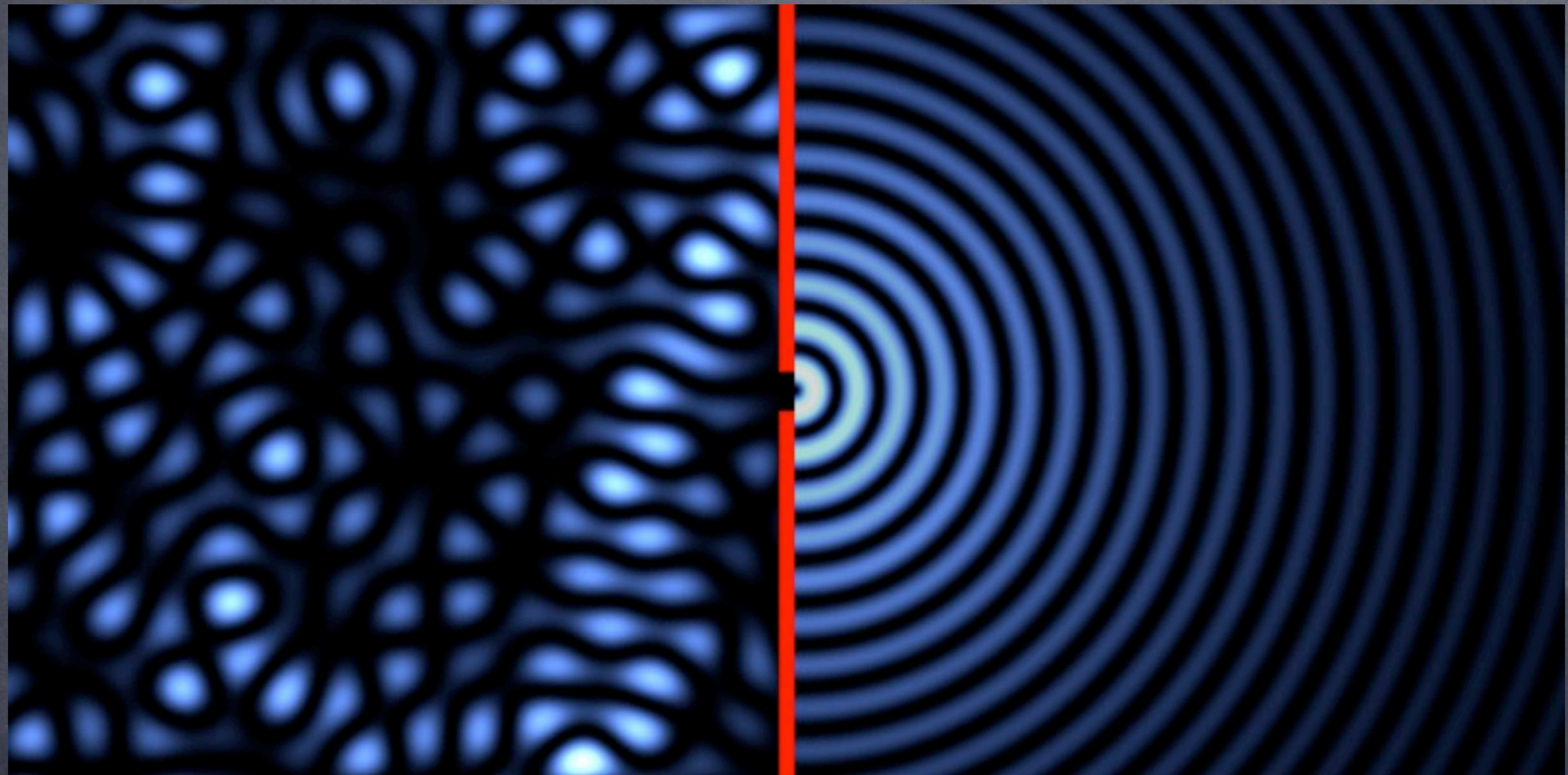
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Principle Number Two

- Originally: light is a percussion propagating in the 'aether'
- Shock propagates by emitting a subsequent shock from every point
- The only variable is the speed of light → geometry!
- Later: (Young & Fresnel) Oscillations are a superposition of waves

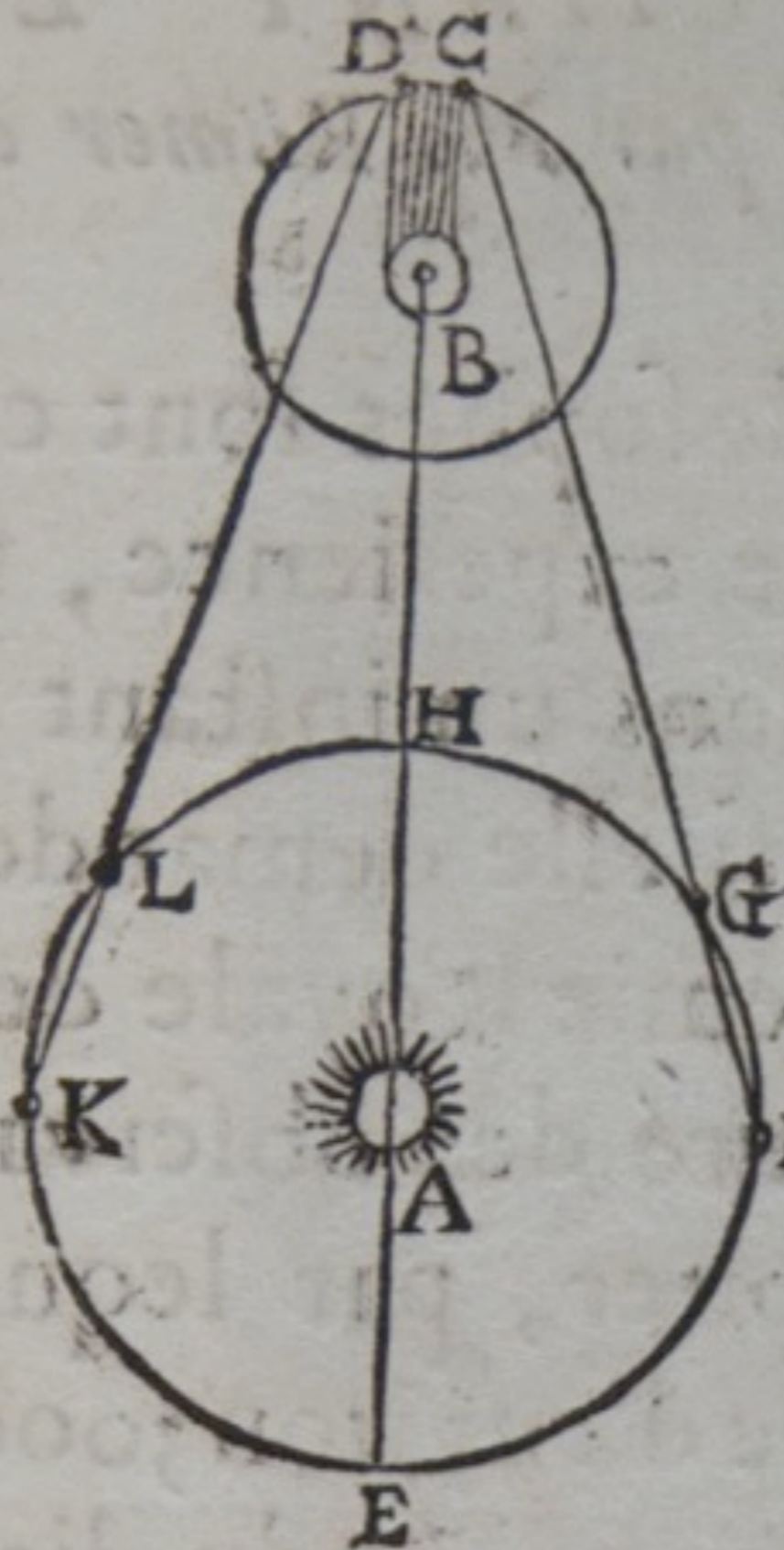


Huygens did not intend to describe this!



The speed of light

- Øle Rømer's observations
 - 270,000 km/s
- Huygens: because the speed of light is finite, it is probably a mechanical phenomenon



~~Dioptrique~~

~~Premiere Partie~~

Traite de la Lumiere.

~~Chapitre 1^{er}~~

Chap. 1.

DES RAYONS DIRECTEMENT ETENDUS.

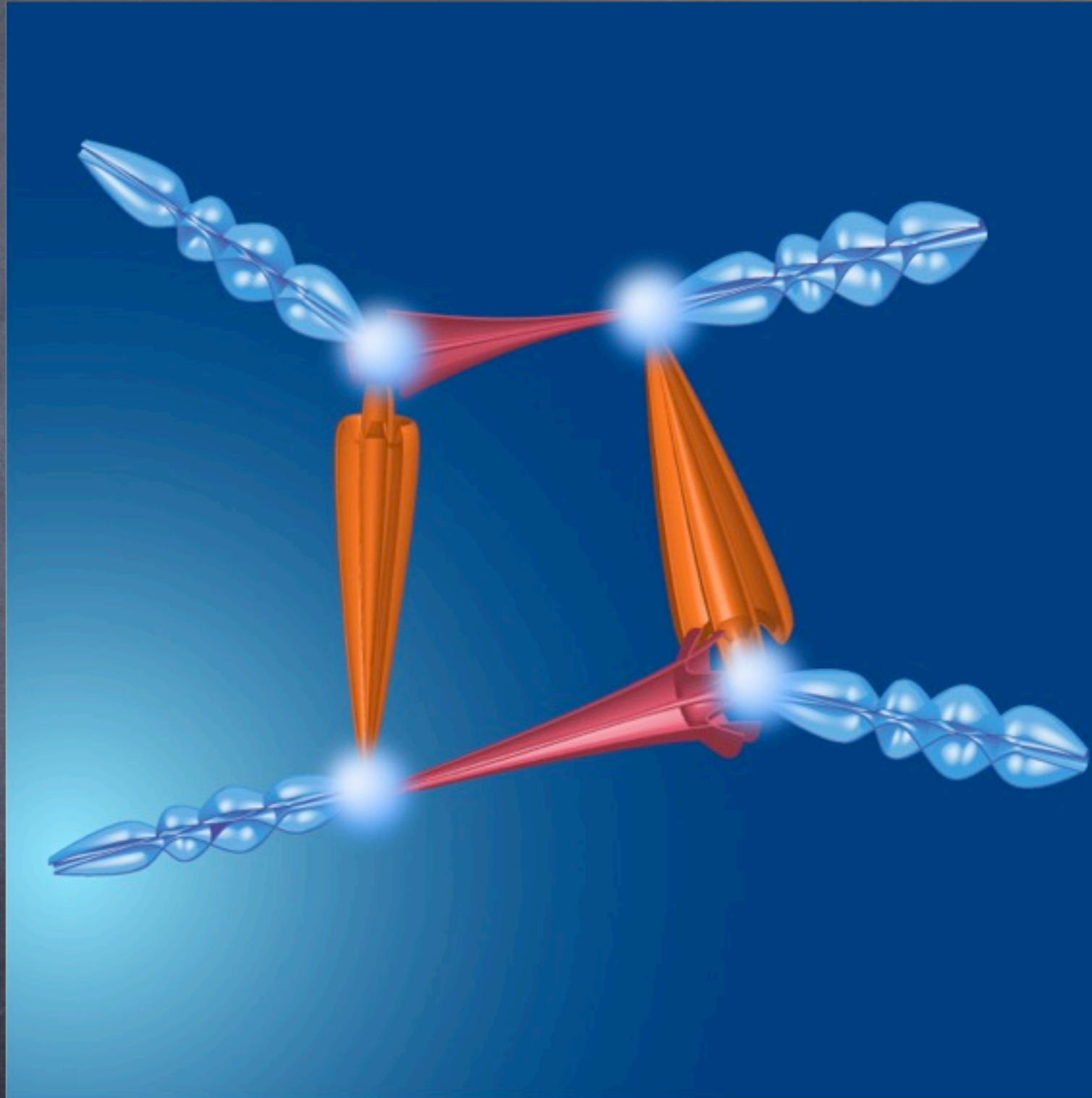
Les demonstrations qui concernent l'Optique, ainsi qu'il arrive dans toutes les sciences ou la Geometrie est appliquee a la matiere, sont fondees sur des verites tirees de l'experience, ~~et de l'experience~~ ^{et de l'experience} que les rayons de lumiere s'estendent en droite ligne, ^{et dans les points} que les angles de

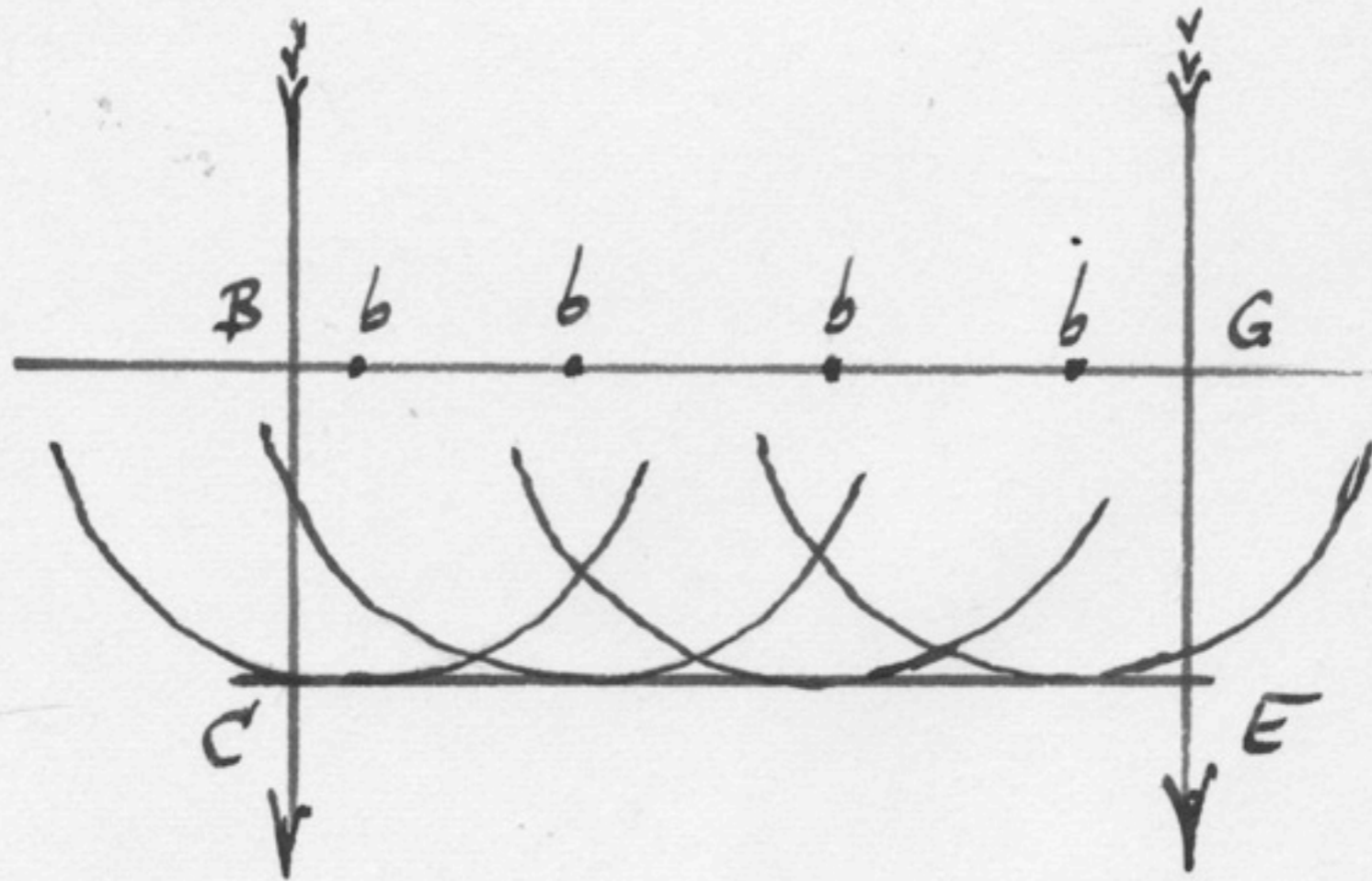
Christiaan Huygens
Traité de la Lumière

Light cannot be
a streaming
phenomenon
because light
rays can cross
without colliding

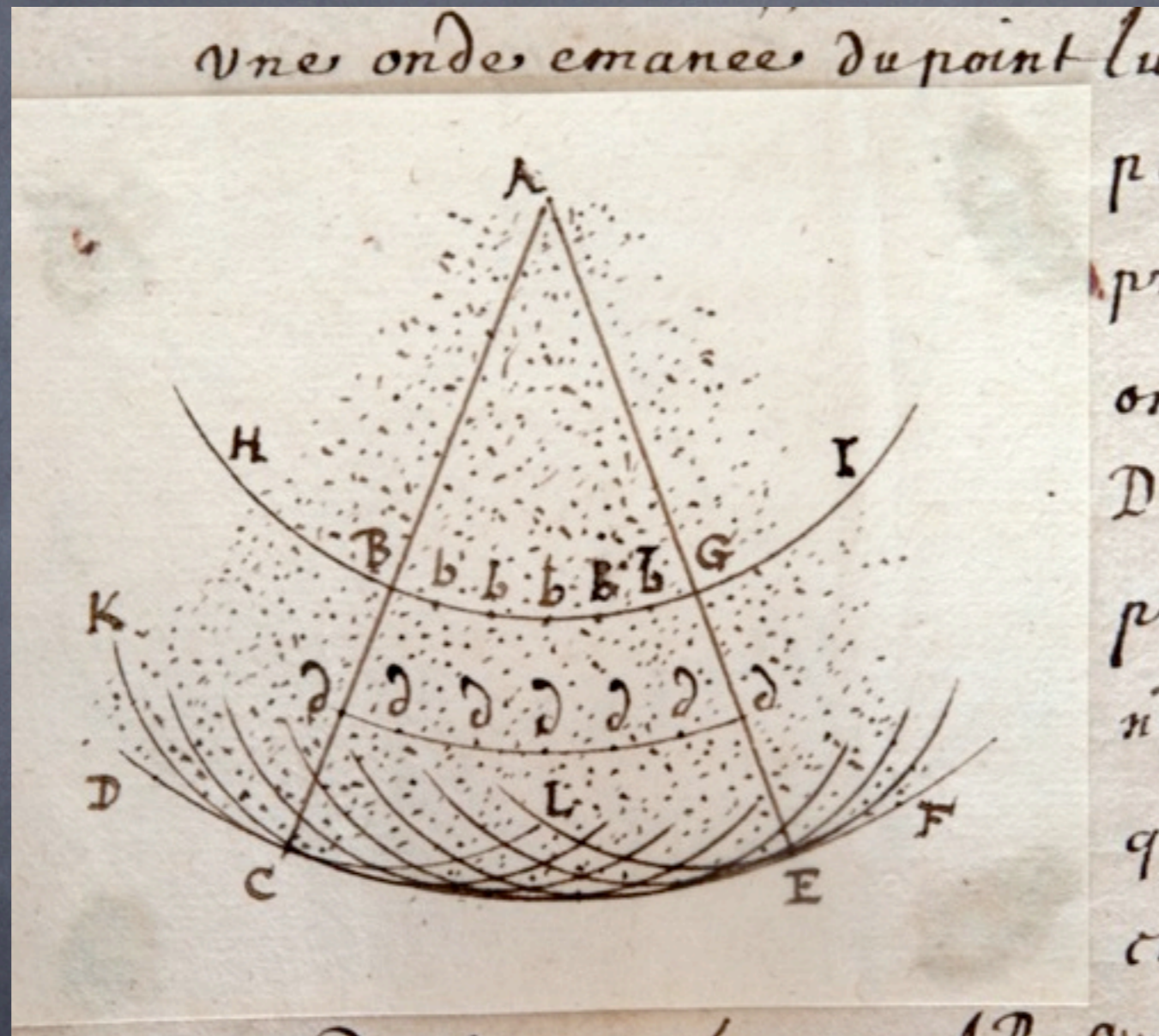


Photon-photon scattering





Christiaan Huygens Traité de la Lumière



~~Dioptrique~~

~~Premiere Partie~~

Traite

~~Chapitre 1^{er}~~ de la Lumiere.

Chap. 1.

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TRAITE
DE LA LVMIERE.

Où sont expliquées

Les causes de ce qui luy arrive

Dans la REFLEXION, & dans la
REFRACTION.

Et particulièrement

Dans l'etrange REFRACTION

DV CRISTAL D'ISLANDE,

Par C. H. D. Z.

Avec un Discours de la Cause

DE LA PESANTEUR.

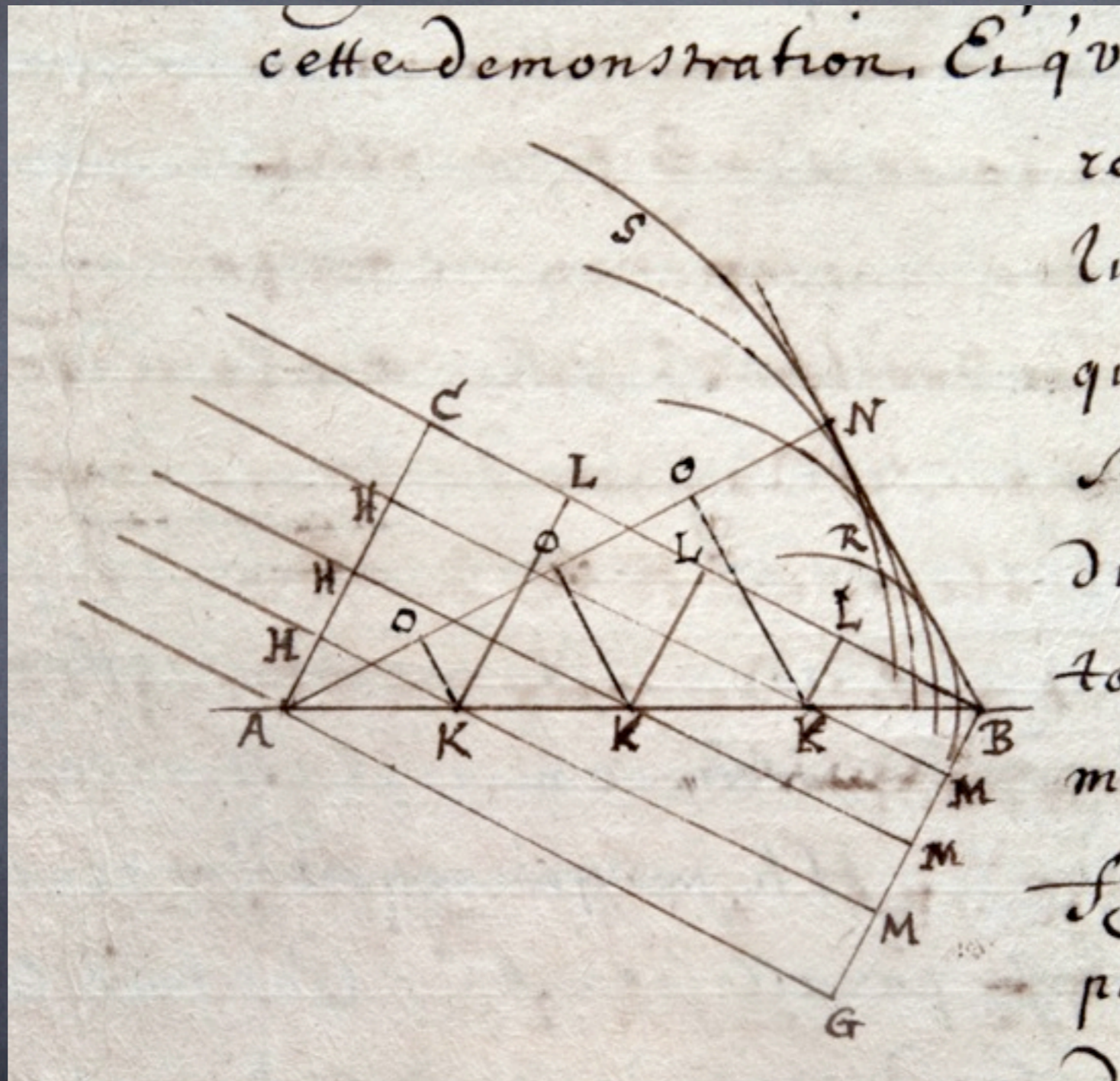


A L E I D E,

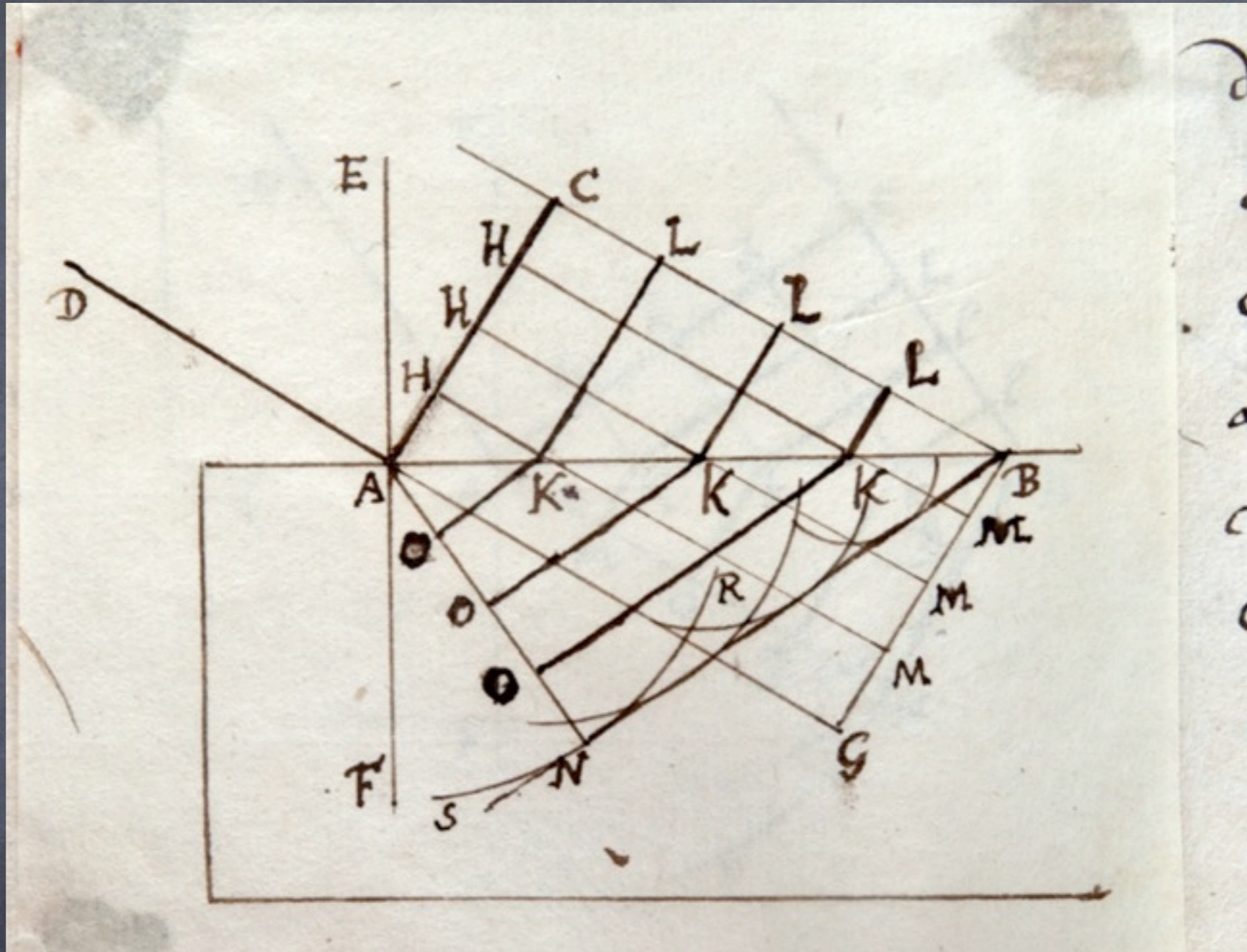
Chez PIERRE VANDER AA, Marchand Libraire.

MDCXC.

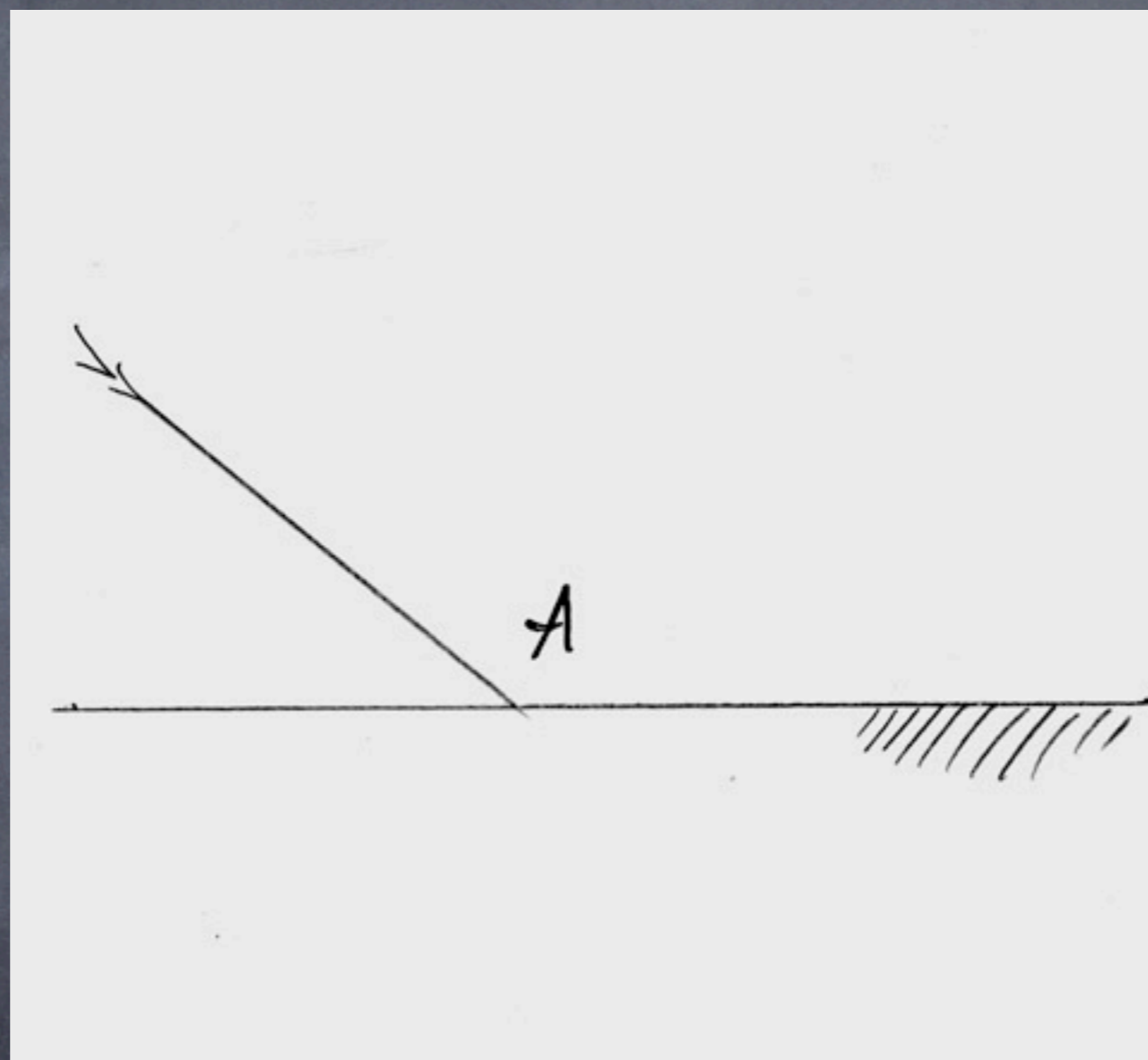
Reflection

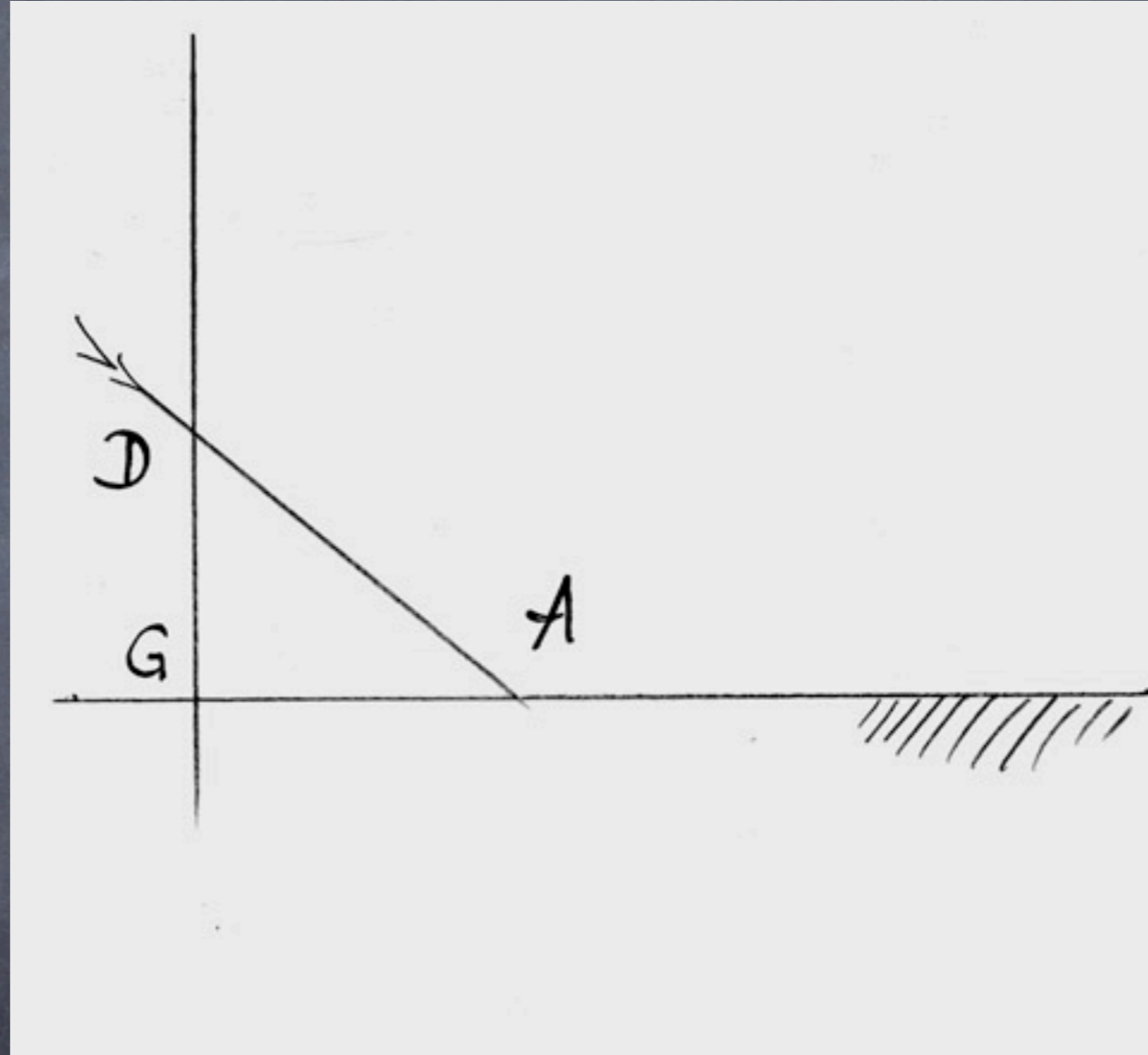


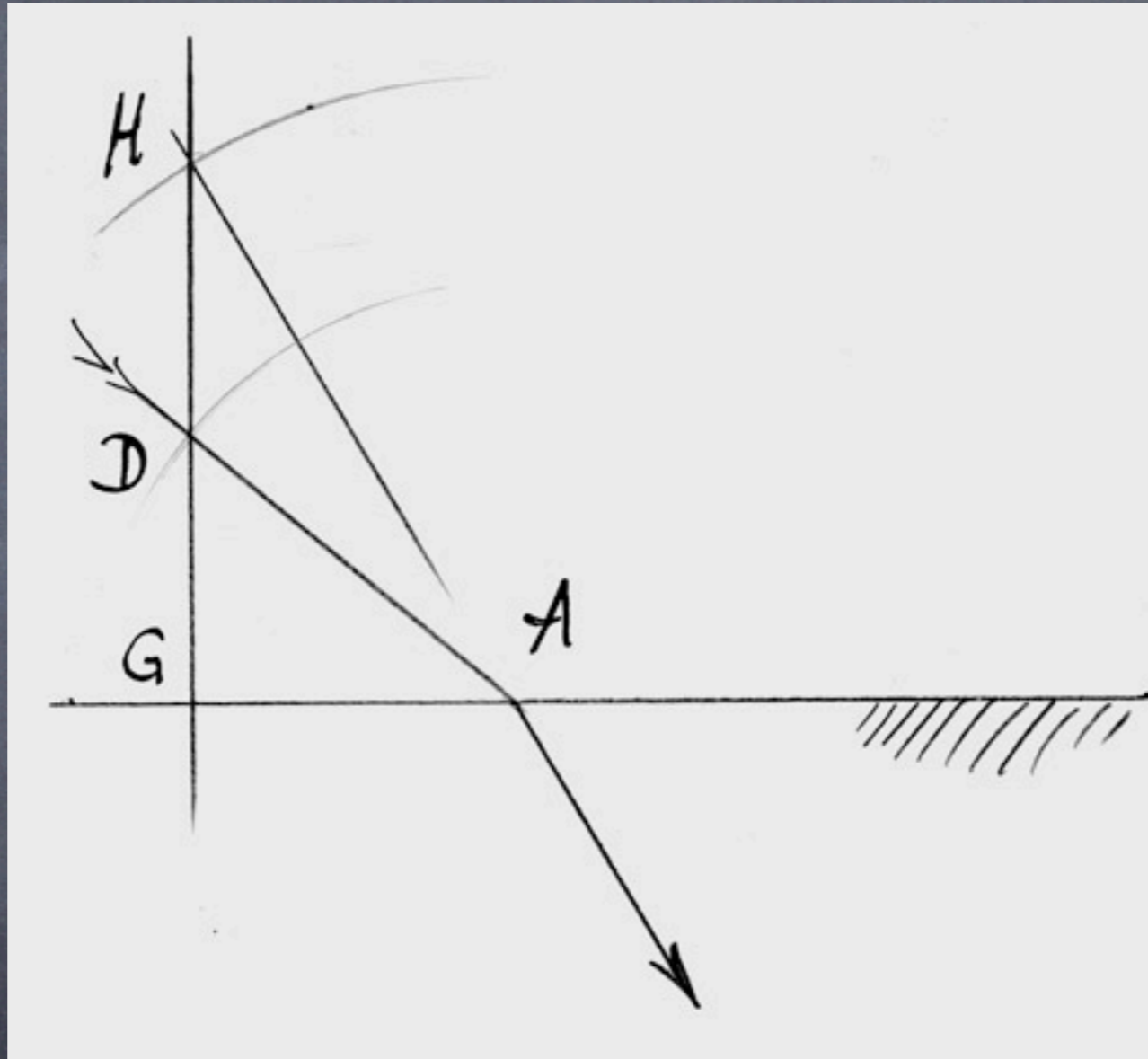
Refraction



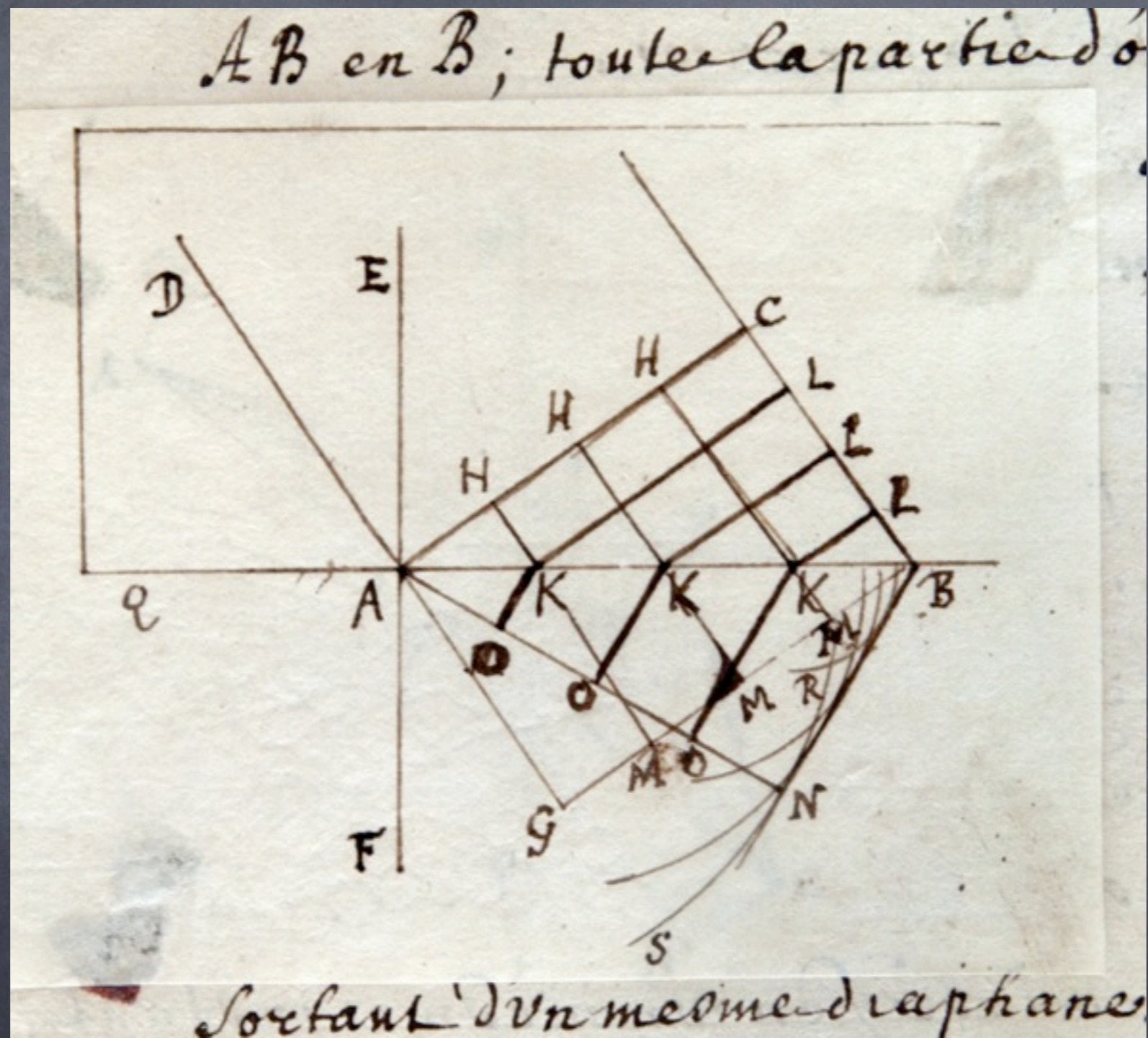
The only variable is the speed of light
→ geometry!



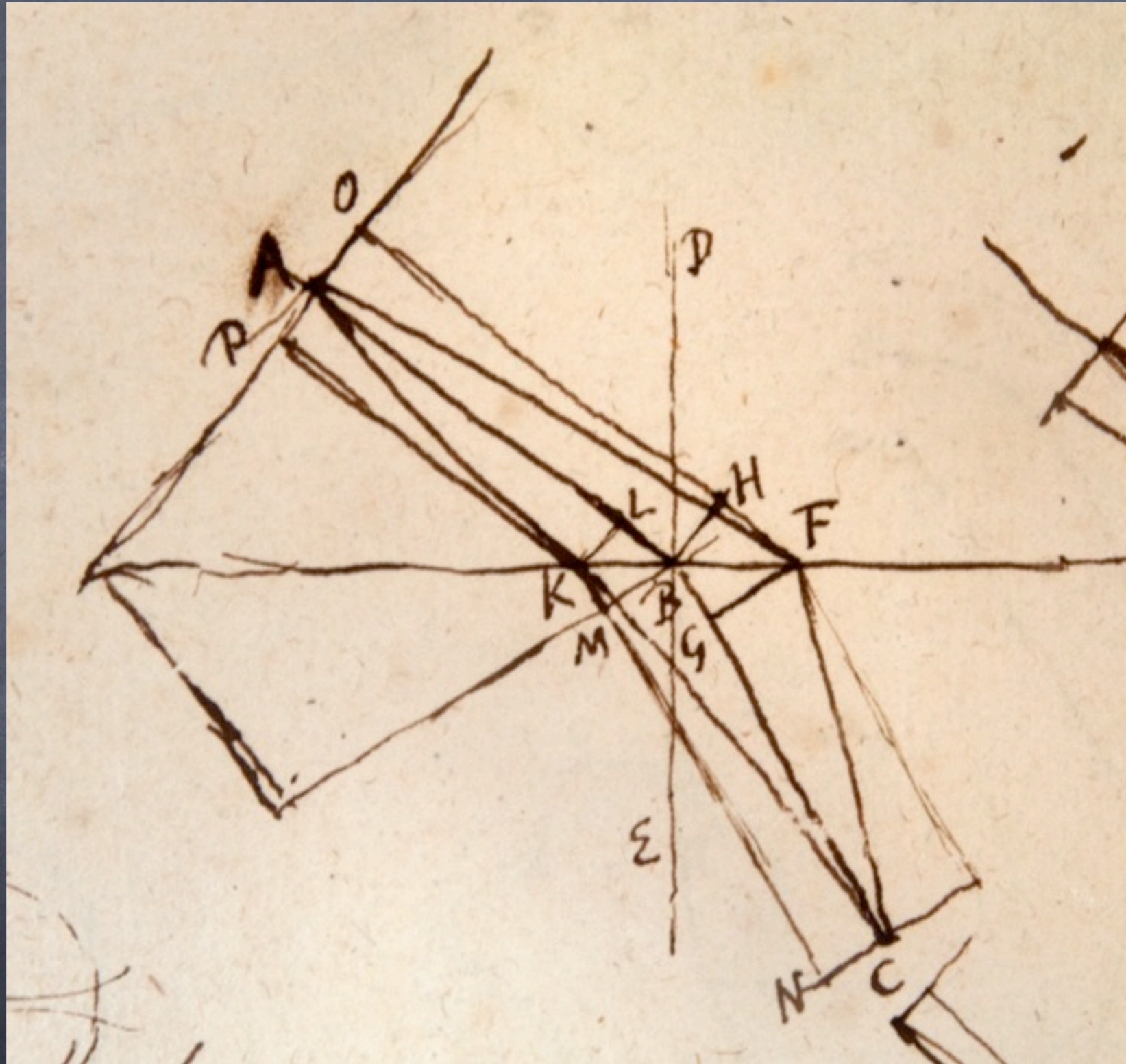




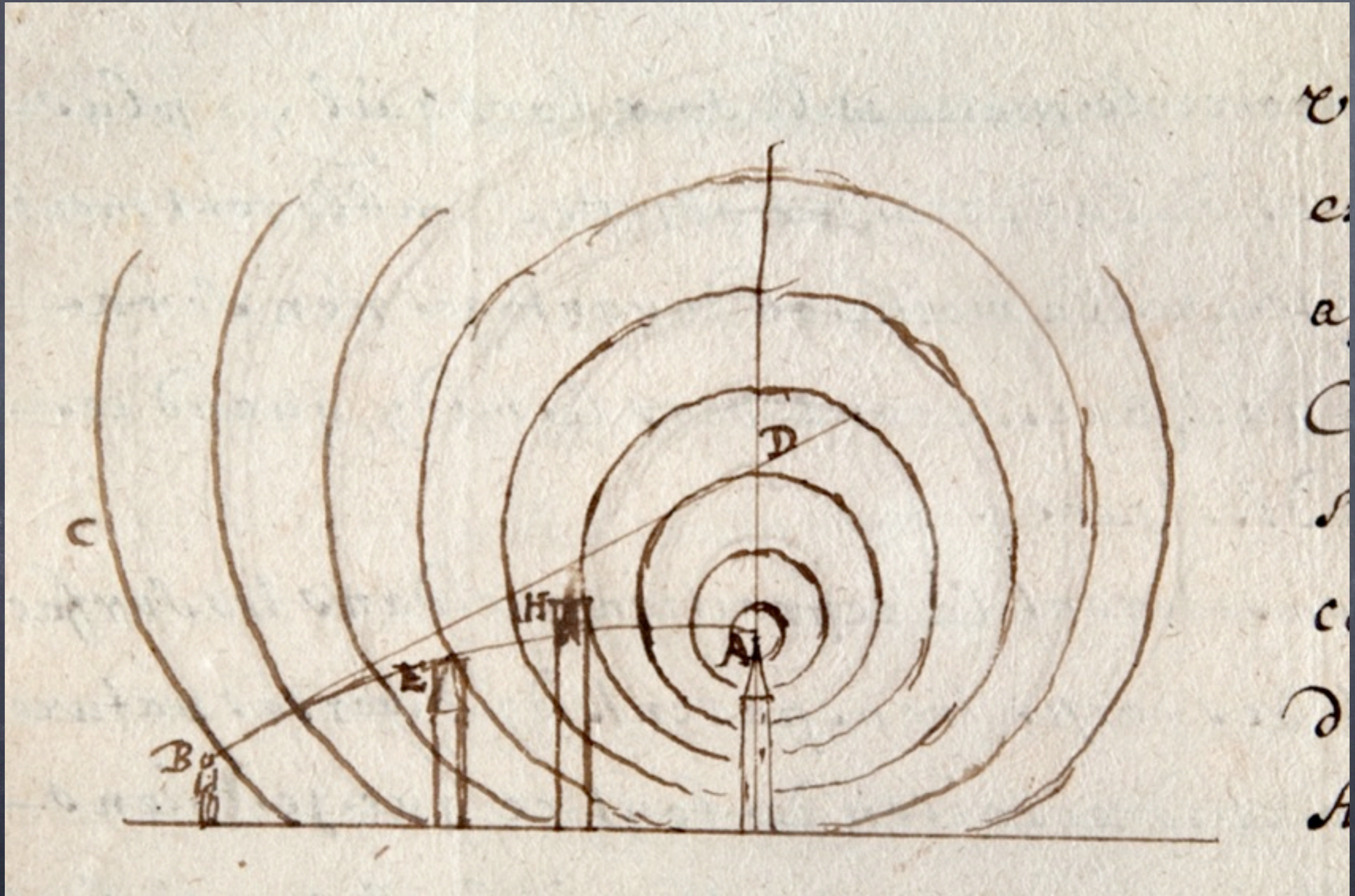
Internal reflection



Fermat's Principle



Atmospheric refraction



Cristal d'Islande

Triumph in the Traité

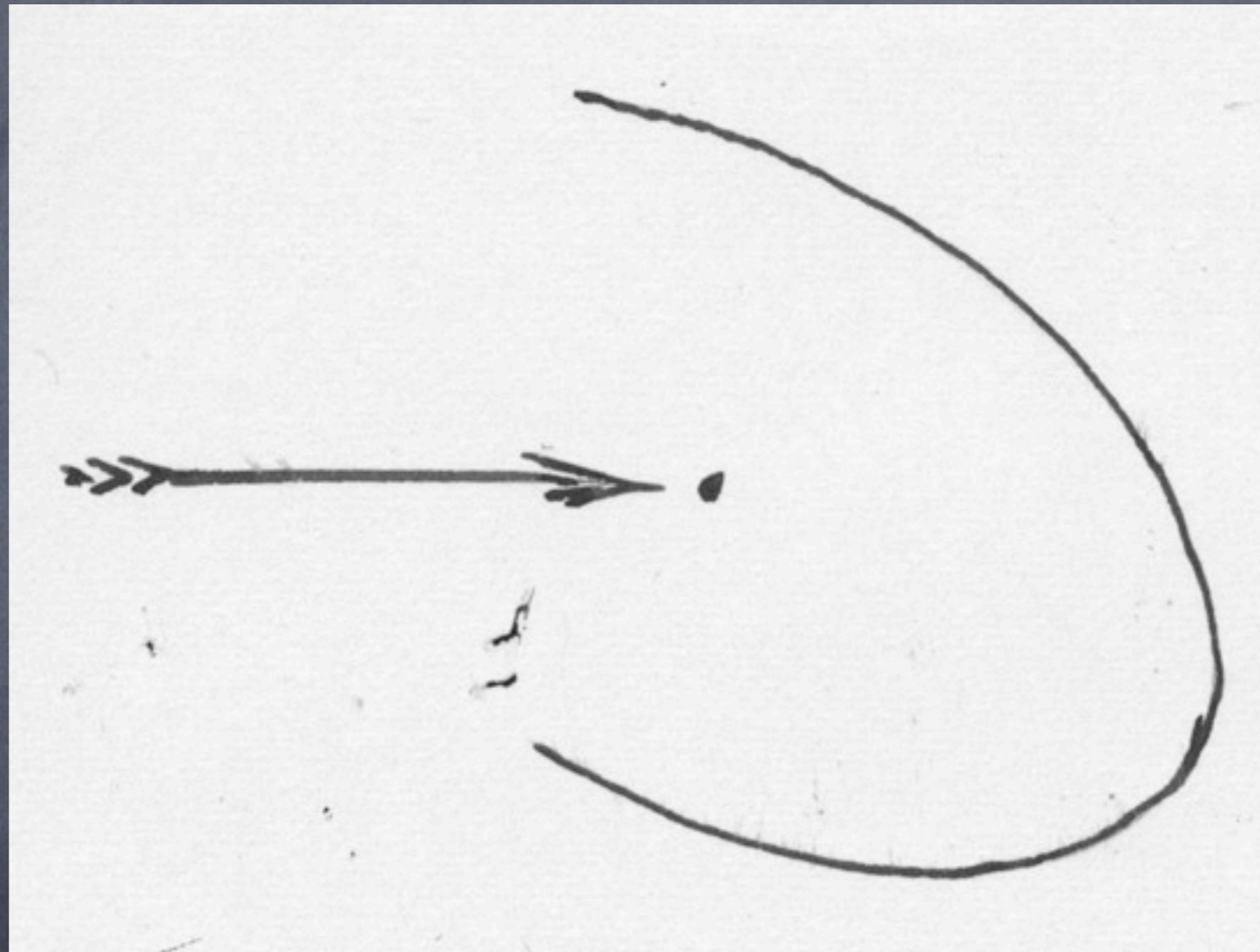
^{baissent}
KM, LN, encore plus que AK, BL, Et ceuy fait assez voir

^{lequel}
^{qui}
^{des}
^{mont}
~~la Courbure des rayons, qu'il falloit demonst^{er}.~~

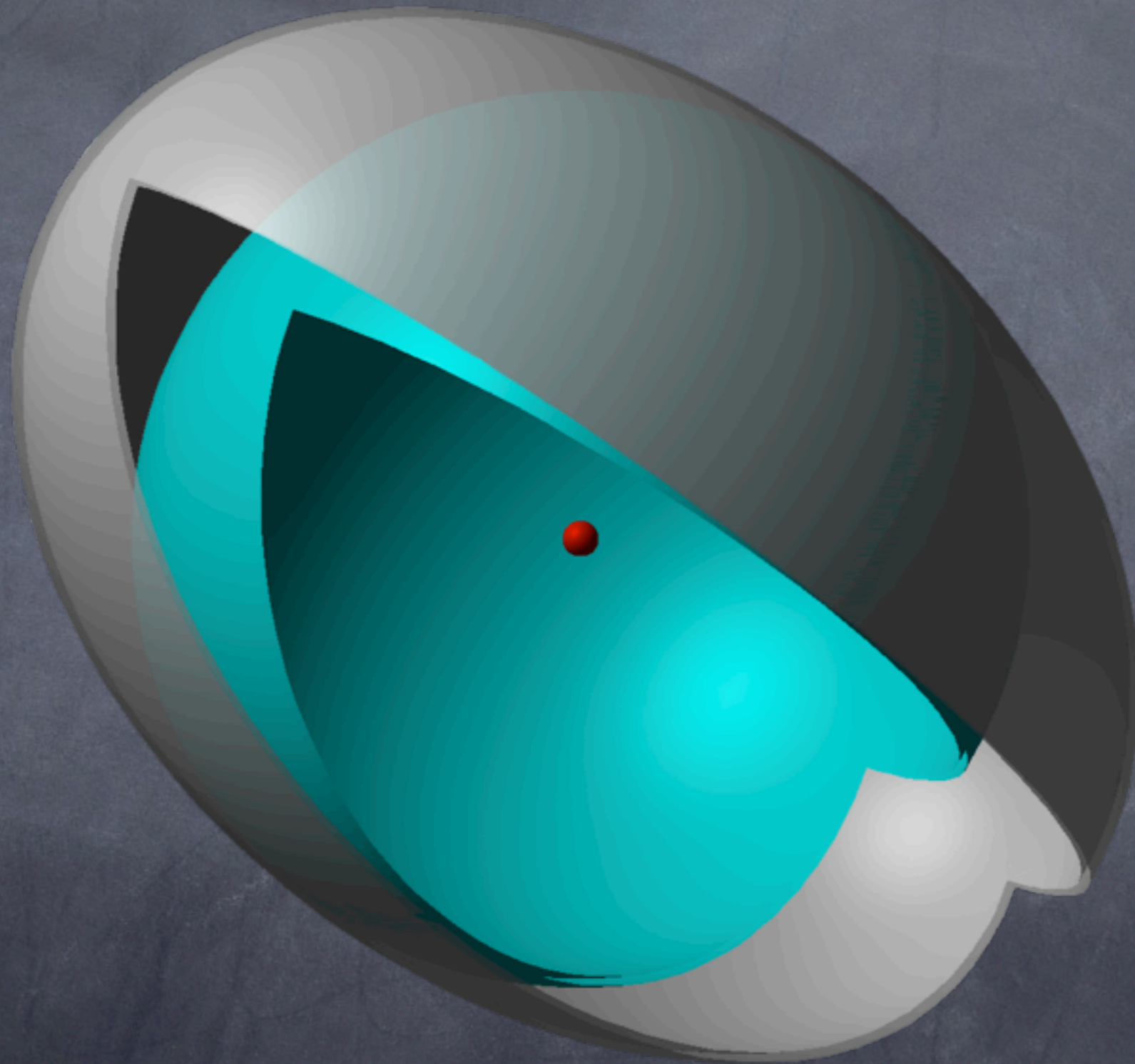
^{estrange} Chap. 5.
De la Refraction du Crystal
d'Islande §

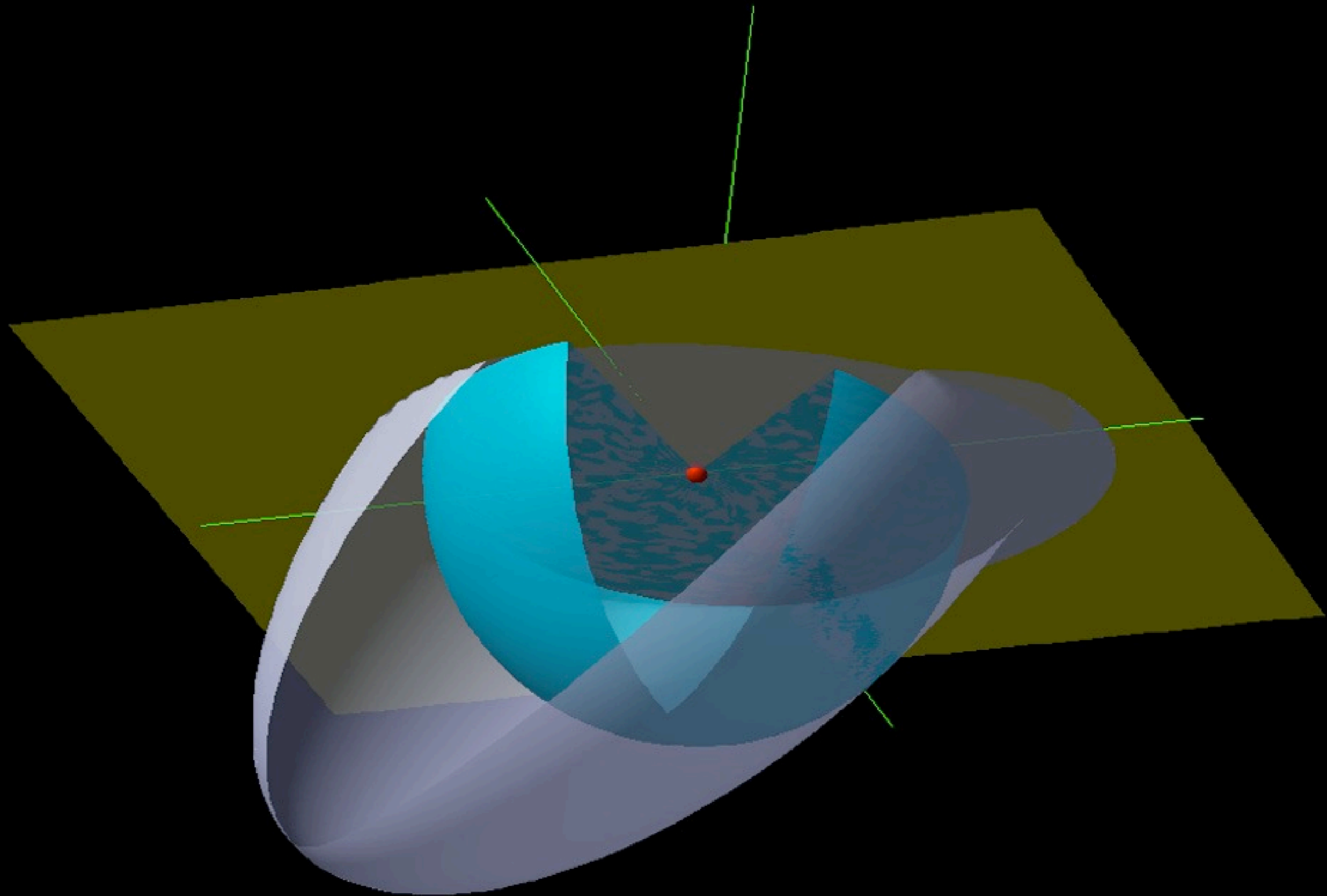
L'on apporte d'Islande, qui est, une isle de la mer ^{se}
^{ptentrionale}, a la hauteur de 66 degres, une espee

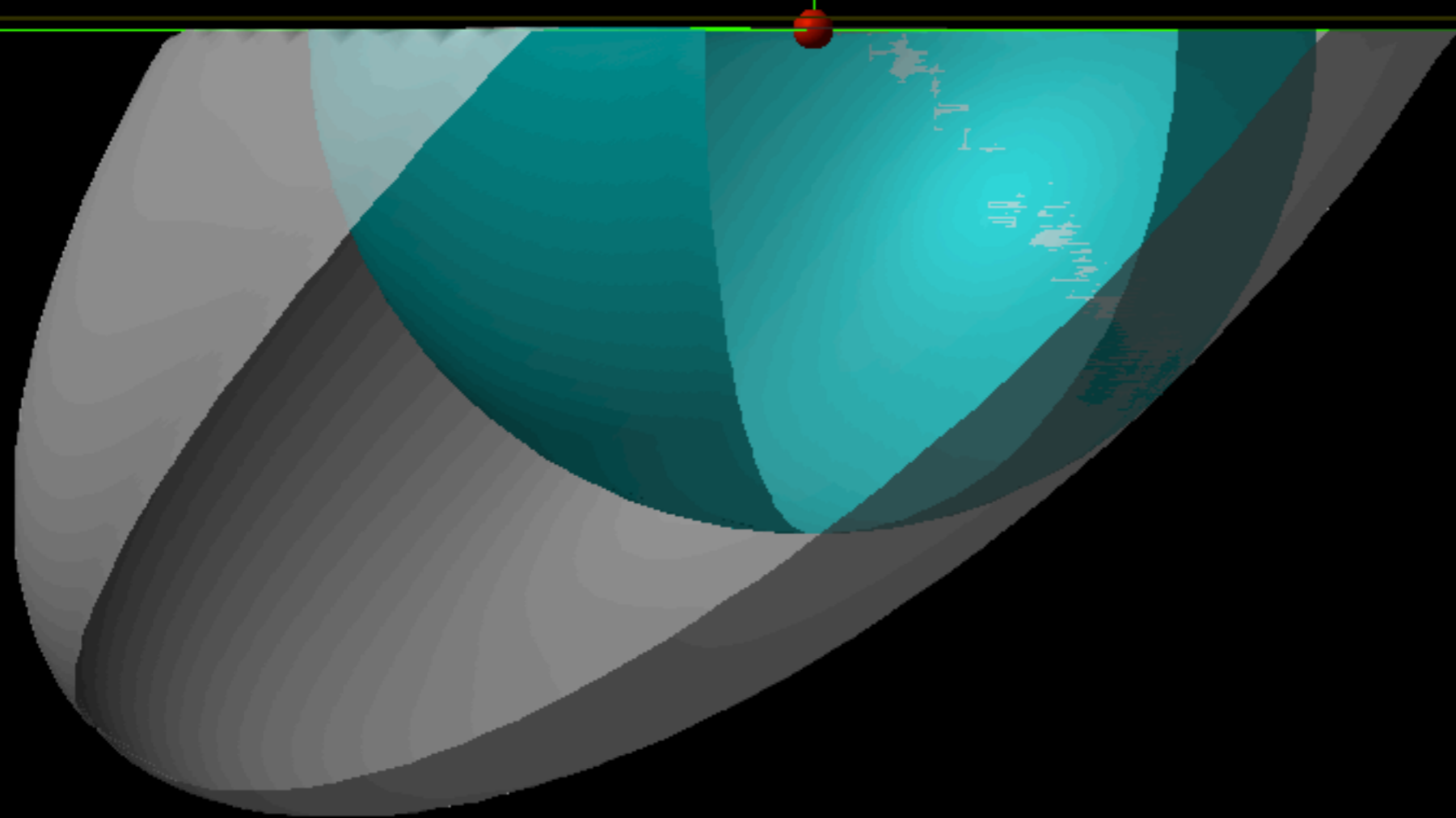
Anisotropic percussion in the aether



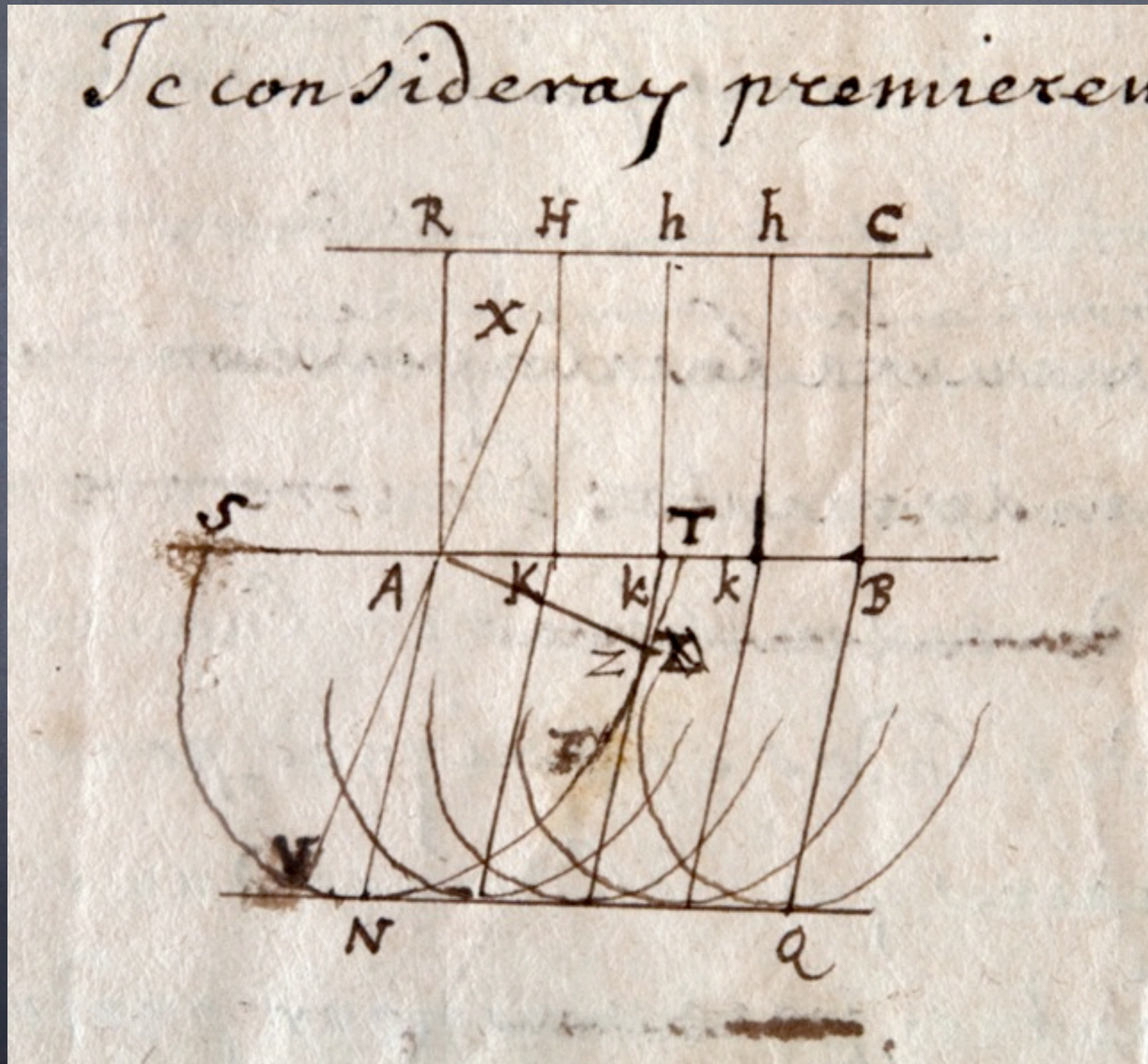
Anisotropic percussion in the aether



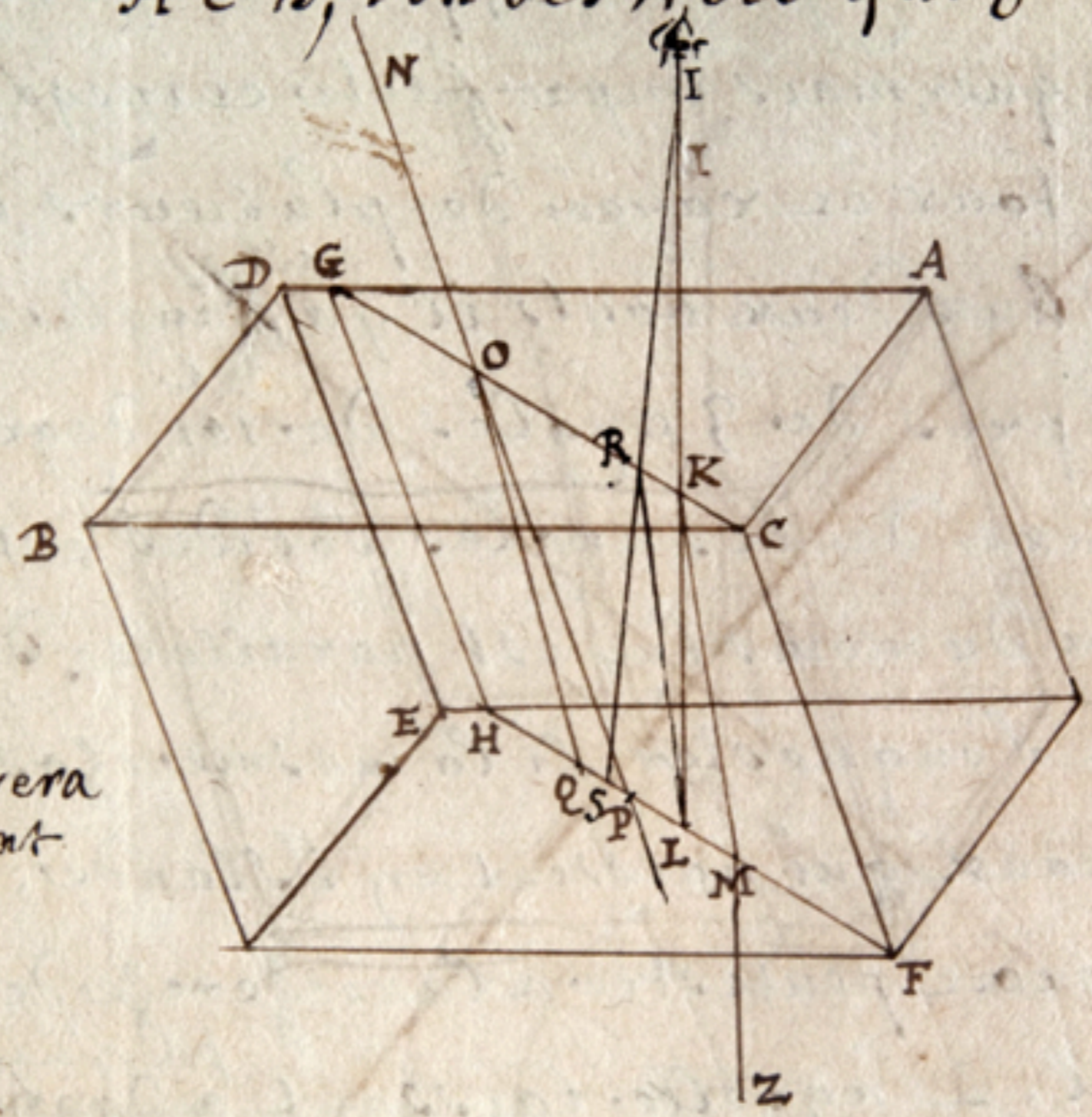




The only variable is the speed of light
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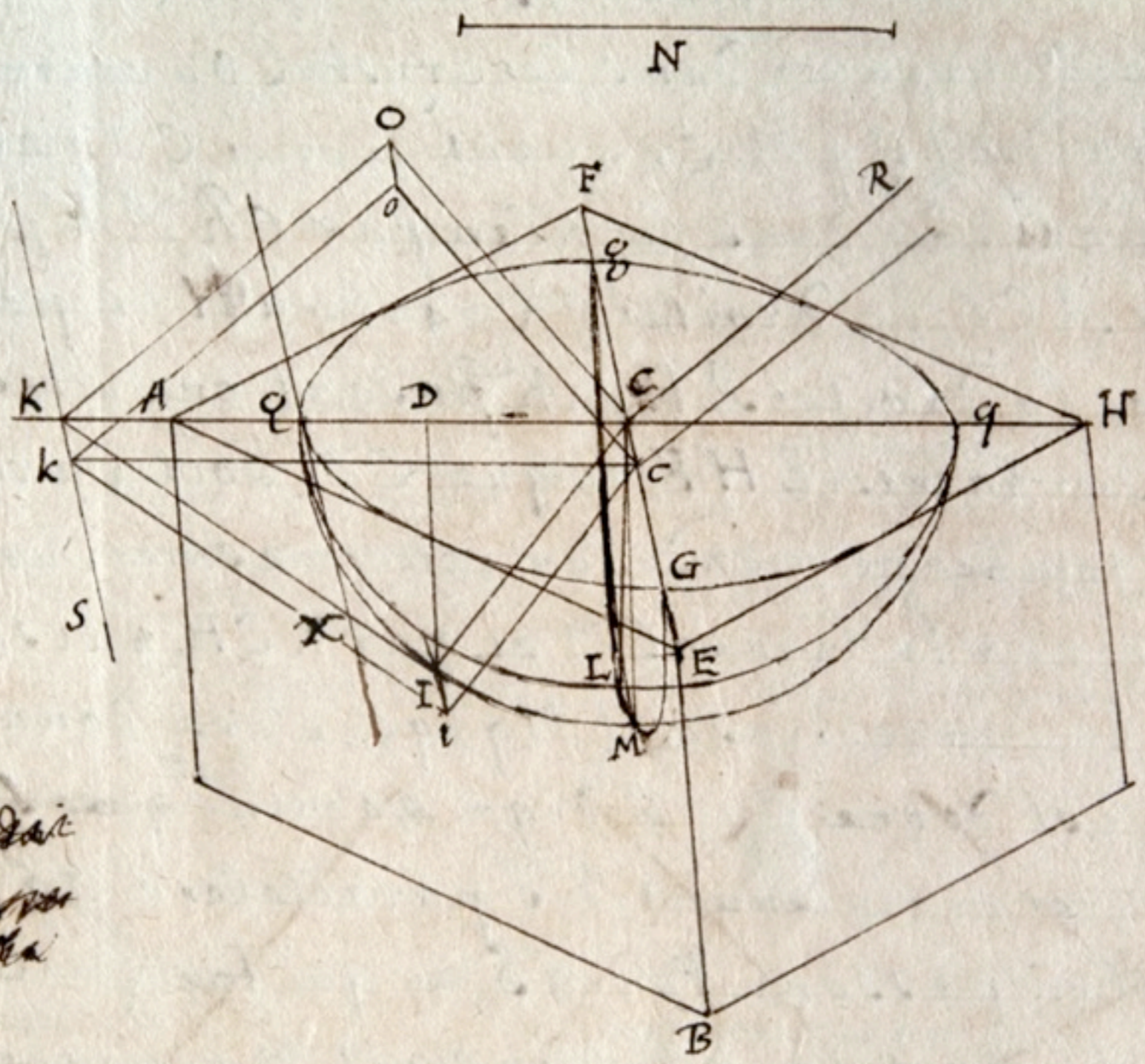


A C B, l'un des trois qui sont



*sera
ent*

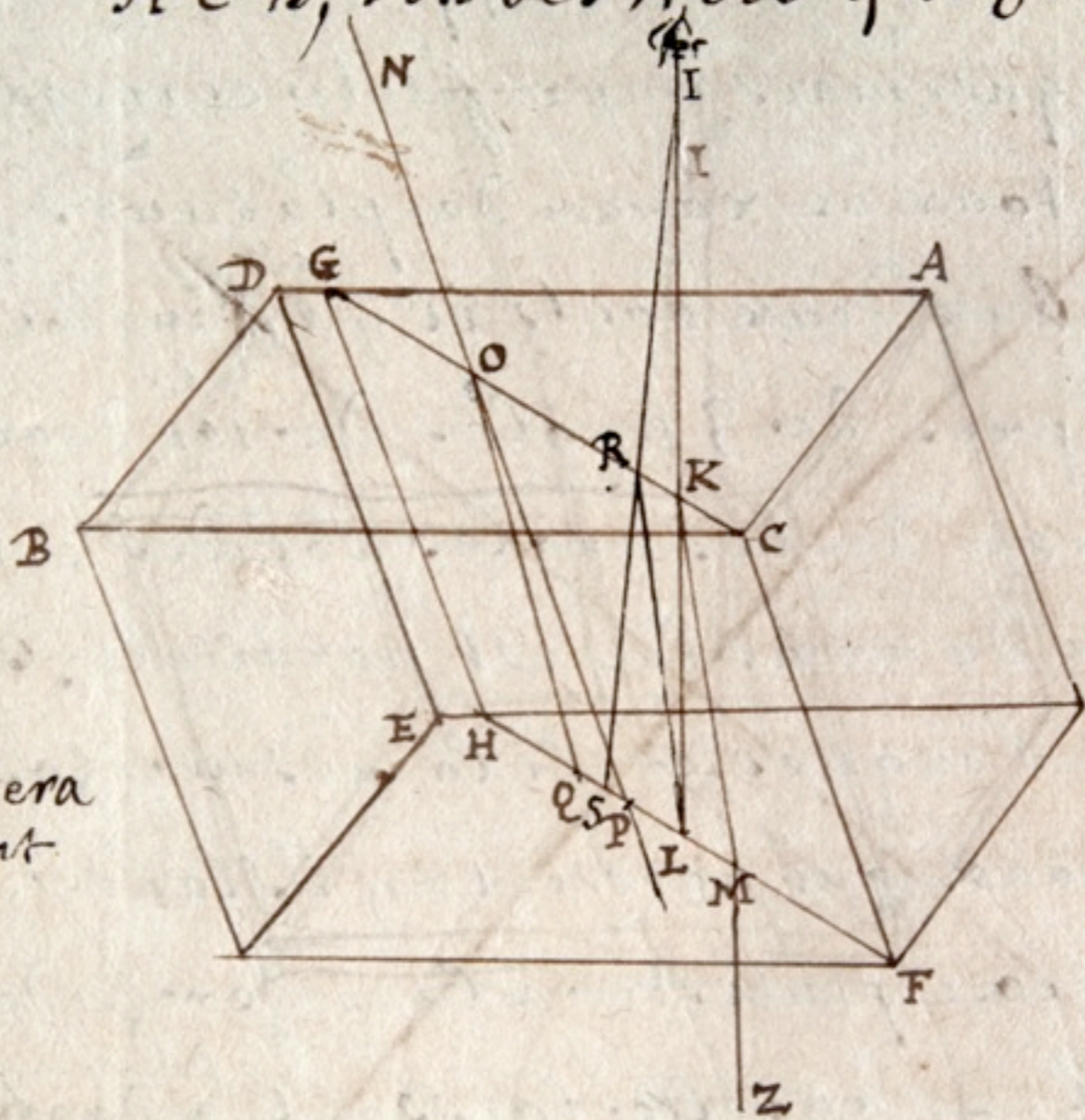
ont cette



Handwritten notes in the bottom left corner, partially obscured and difficult to read.

Handwritten notes in the right margin, partially obscured and difficult to read.

A C B, l'un des trois qui sont



*sera
ent.*

ont cette

MA sive KA Q HA ita loq
 AG ad AO ut AK ad AK
 sicut HN in MN Q NA
~~AKA~~. Ergo x a quo
 AH sicut AH ad AK.
 ad 98470.



ΕΥΡΗΚΑ 6 Aug 1677.
 Causam mirae refractionis
 in Crystallo Islandica.

AC radius recta penetrans.
 AB refractionis radij perpendicularis.
 AS axis anguli solidi obtusi.
 AP perpend. AS, axis Ellipsis in
 spheroidis, tangenti BD in B.
 BN, BO perpend. in AP, AS.
 AP media prop. inter AZ, AD. Nam A.

Huygens's Principle

Number One

- Laws of Nature do not exist
 - Scientific discovery is totally unlike discovering unknown islands
- Facts exist, but nothing is perfectly certain
- The primary product of science is failure
- Evolution of knowledge and understanding

Principle of Research

One will see here demonstrations that do not offer as great a certainty as Geometry, and may occasionally differ strongly from that. Because, where mathematicians prove their propositions by sure and incontestable principles, in this case the principles are verified by reference to the conclusions drawn from them. The conditions of nature give us no alternative.

Principle of Research

Still, it is possible to attain a degree of probability that quite often is hardly less than complete certainty.

Namely when the things that one has deduced from the supposed principles correspond perfectly to the phenomena that observations show us; especially when there are a large number of these, and still more powerfully when one formulates and predicts new phenomena, that must result from the stated hypotheses, which then actually are found as foreseen.

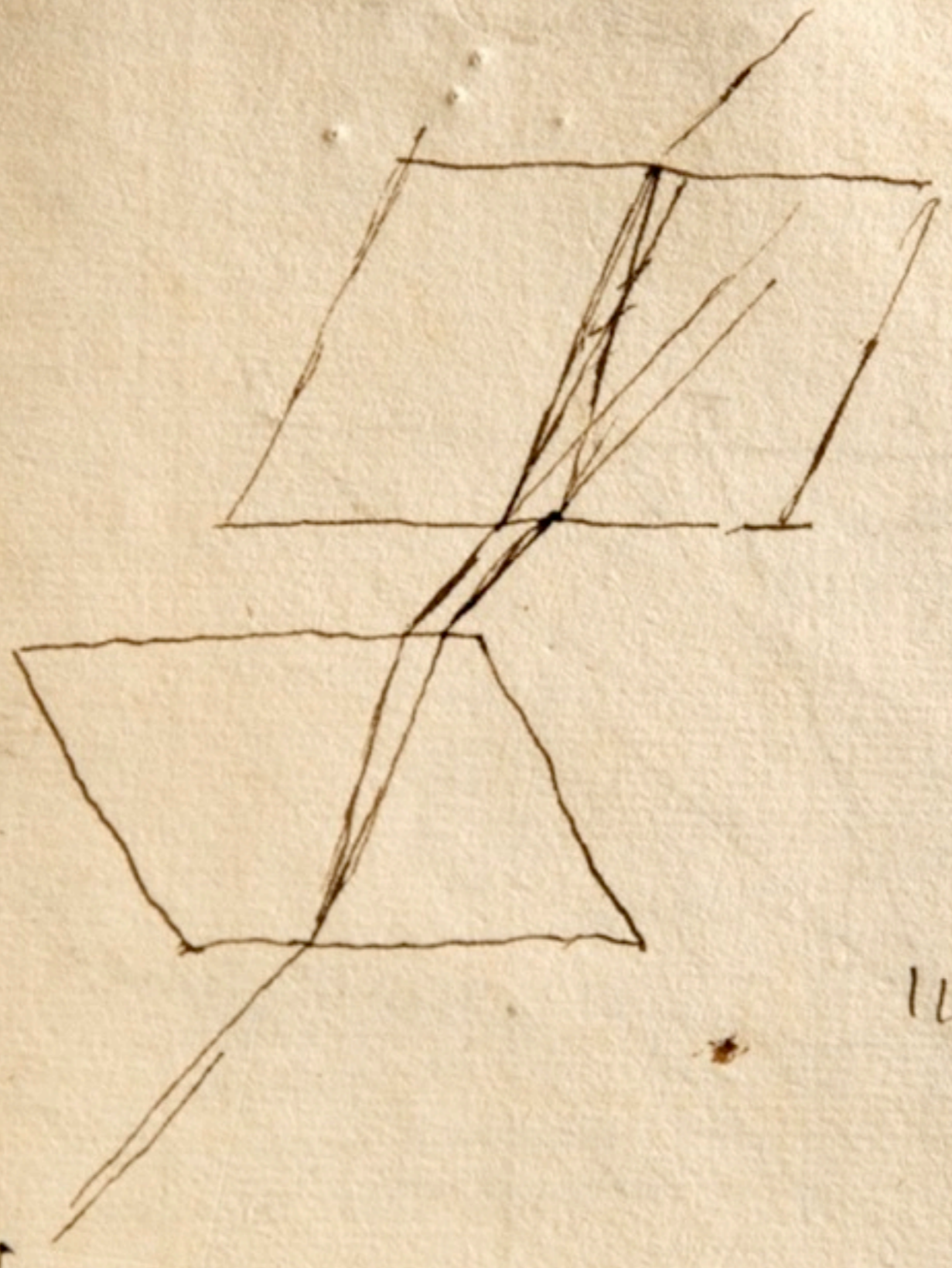
Christiaan Huygens, uit: *Traité de la lumière*

But now, for the first time, an entire natural philosophy is treated by Huygens as a hypothesis, the utility of which is not assumed to begin with but must be tried and tested anew every time. By now, we are hardly aware that it was ever different; but before the years 1652-1656 even the possibility of such an approach was not considered.

prof. Floris Cohen – De herschepping van de wereld

Huygens's Macho

Before concluding my treatise about this crystal, I will add yet another splendid phenomenon, which I have discovered after having written all of the above. For although I have not found its cause thus far, I will not refrain from mentioning it, in order to give others the opportunity to search for that cause.



III

per bina rora
 Islandica pro
 ratione prime
 inclinationis
 lucida simpli
 tur .x. y. q. r.
 Equis crystalli
 ...

Lumière comme A

