

**Tyumen State University
The Department of Foreign Languages and Cross-cultural
Communication**

Reflection of Light

Submitted by: Pavlov Alexander

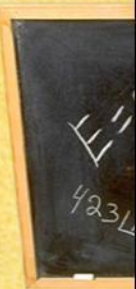
Group: 25RPhII2

Research supervisor: a junior teacher Skopich N.P.

Tyumen, 2013

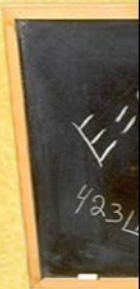
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The Aim of my presentation:

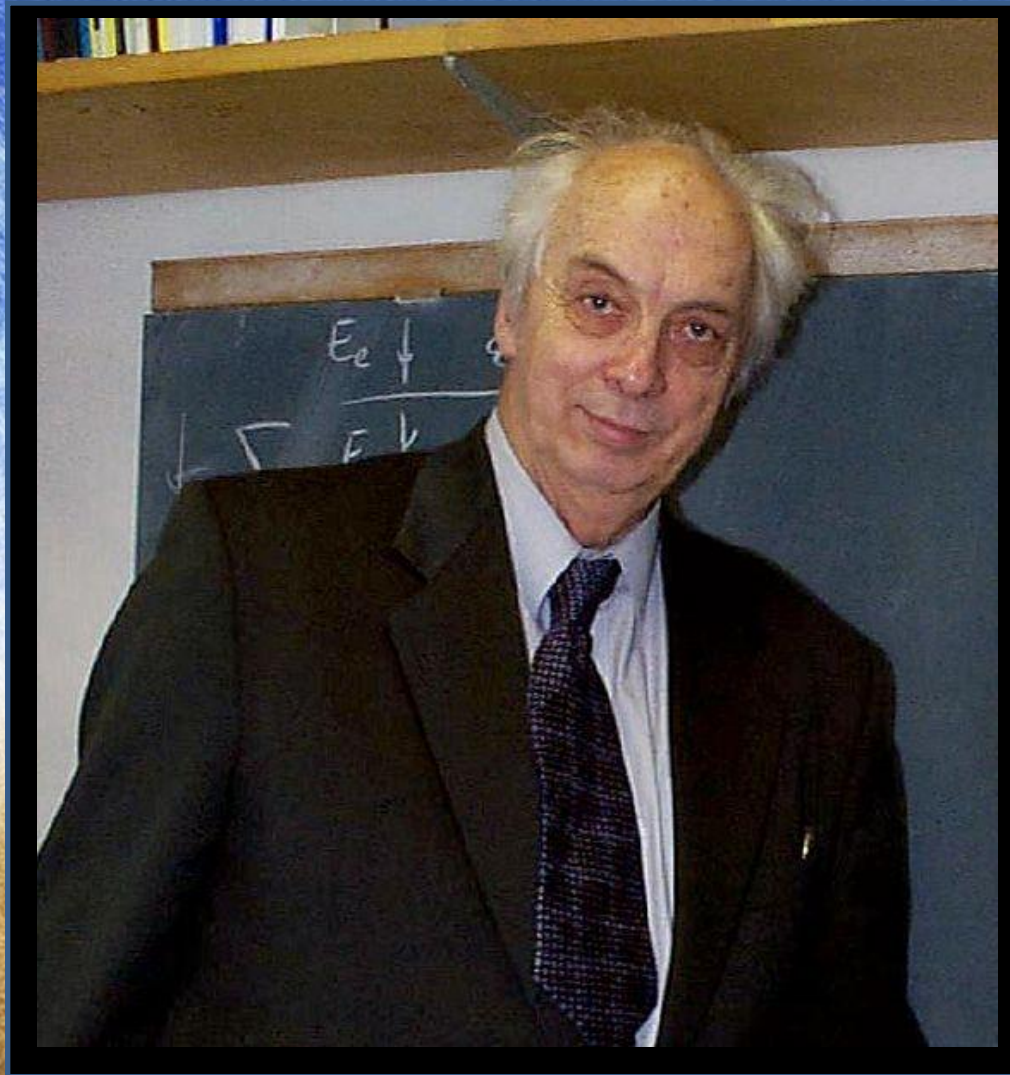
- Tell you about the negative refraction of light
- Explain the practical application of this phenomenon



Historical Information

The first mention of metamaterials with negative refractive index appeared in the article of the Soviet physicist Victor Veselago published in the journal "Advances of Physical Sciences" in 1968.





Victor Veselago, Soviet Physicist

UFN

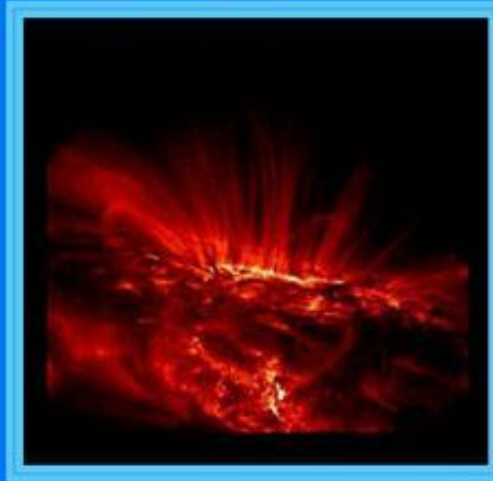
— СОВРЕМЕННОЕ СОСТОЯНИЕ НАИБОЛЕЕ АКТУАЛЬНЫХ ПРОБЛЕМ ФИЗИКИ —

НАУКИ О ЗЕМЛЕ

ФИЗИКА

МАТЕМАТИКА

**Успехи
Физических
Наук** Advances
in Physical
Sciences



Advances in Physical Sciences



Negative refraction

$$\epsilon < 0$$

$$\mu < 0$$

ϵ - permittivity

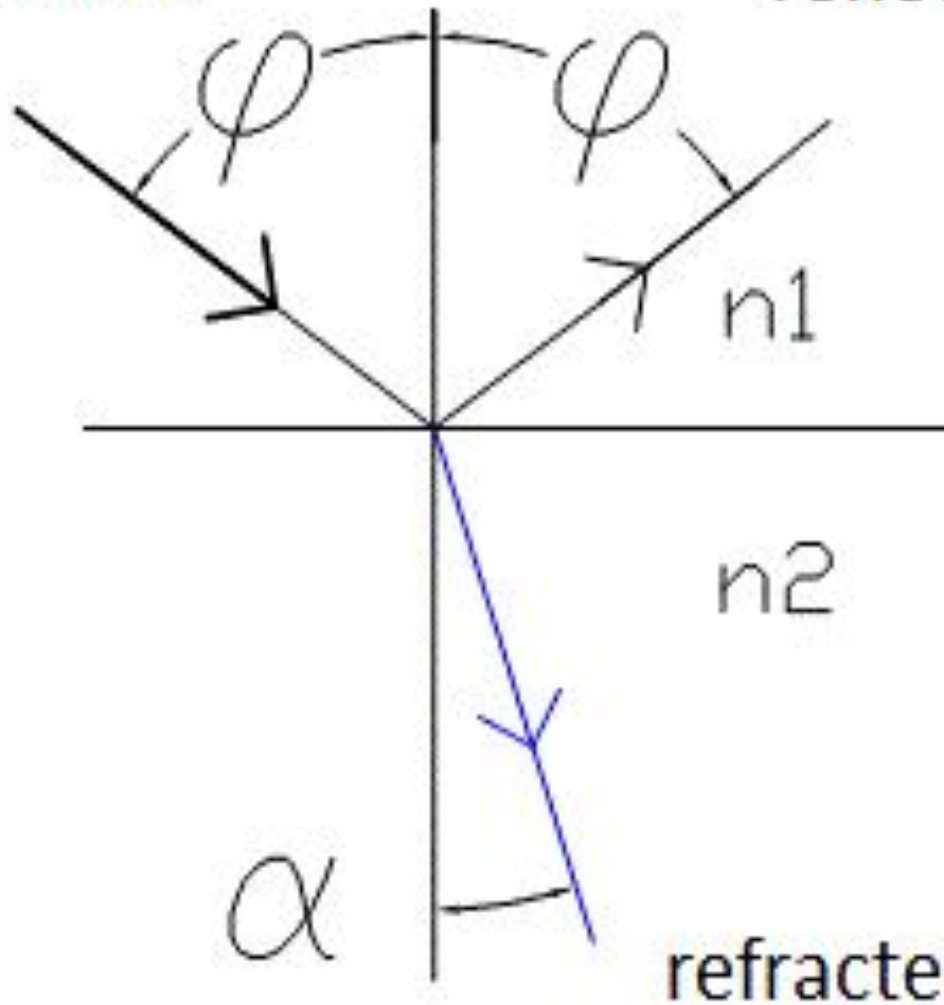
μ - permeability



Normal material

incident wave

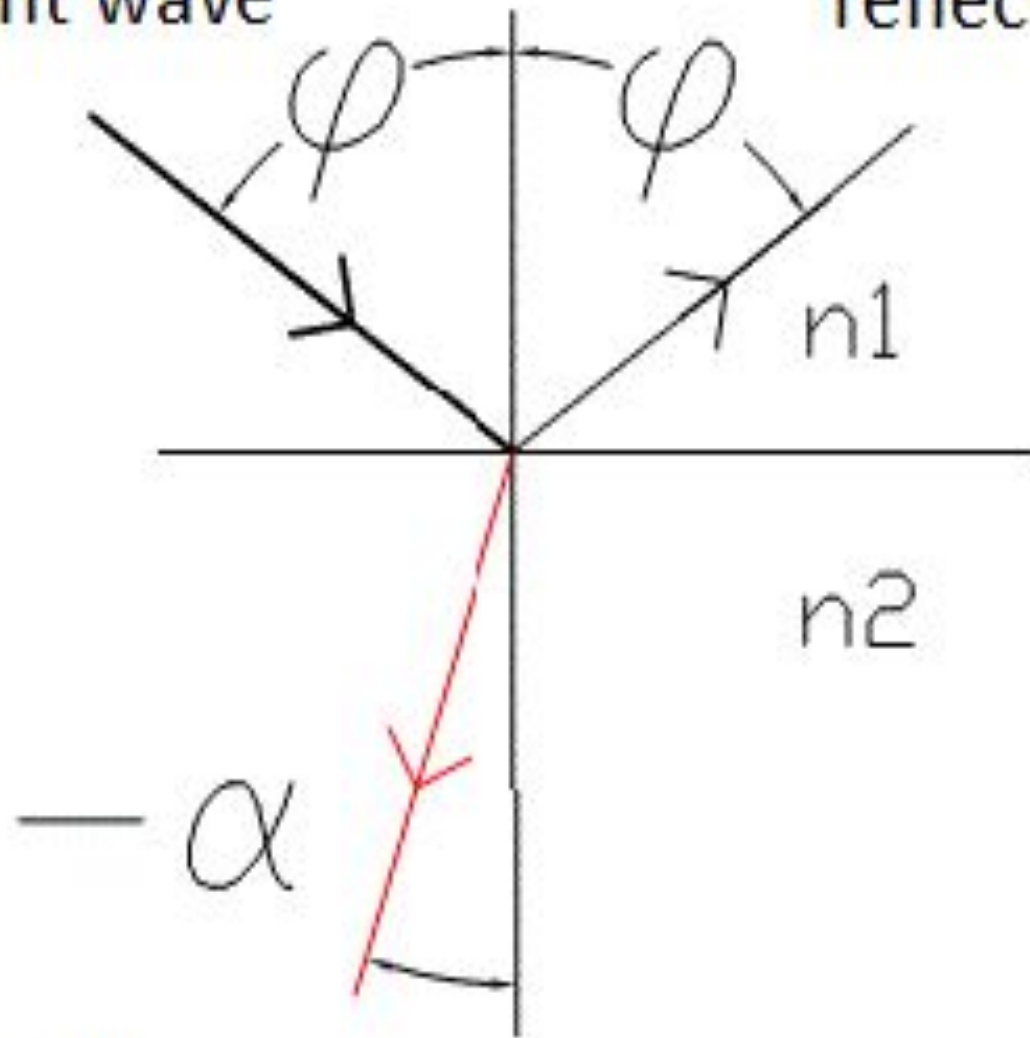
reflected wave



Metamaterial

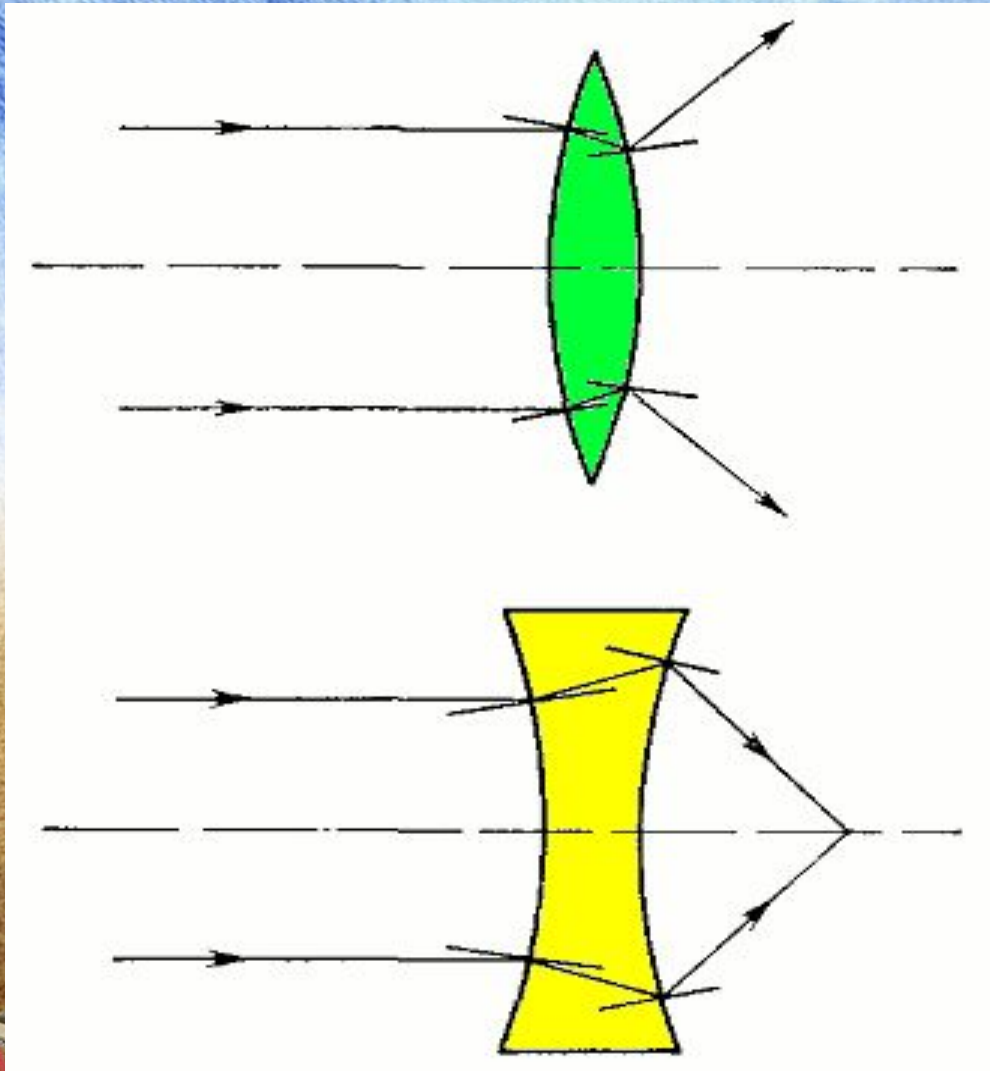
incident wave

reflected wave

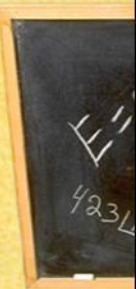


refracted wave

Practical application



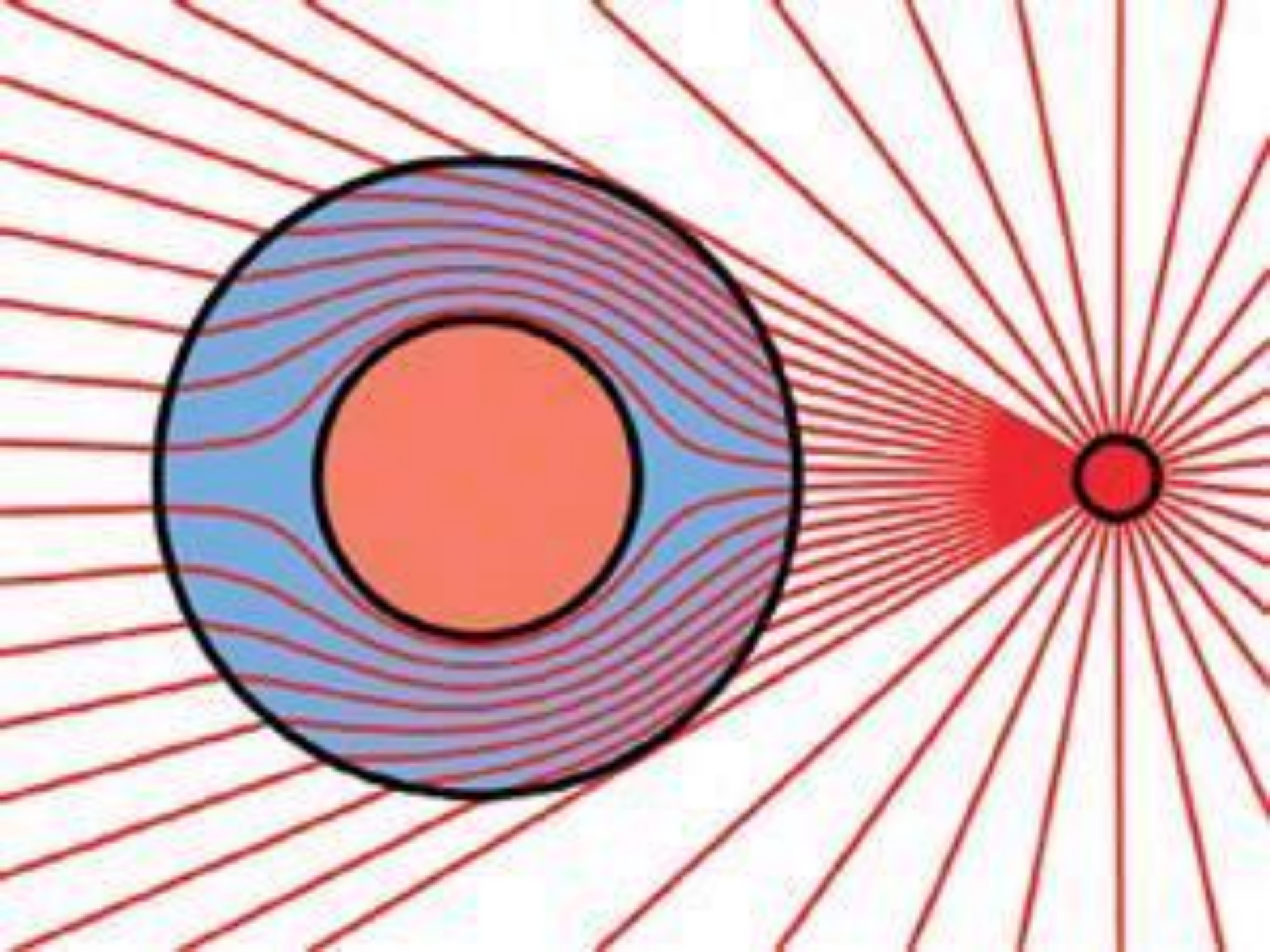
The structure of metamaterial



Cloak of invisibility

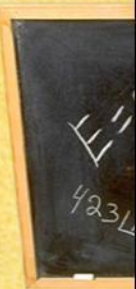






Conclusion

In conclusion I would like to say that this trend is developing very fast and is already being used for military purposes. Likely this phenomenon will play a big role in our future.



List of information sources :

1. [http://en.wikipedia.org/wiki/Metamaterial#
Negative refractive index](http://en.wikipedia.org/wiki/Metamaterial#Negative_refractive_index)
2. <http://www.nanonewsnet.ru/articles/2010/kak-obnaruzhit-plashch-nevidimku>
3. <http://wn.com/Metamaterial>
4. [http://hyperphysics.phy-astr.gsu.edu/hbase/
geoopt/refr.html](http://hyperphysics.phy-astr.gsu.edu/hbase/geoopt/refr.html)
5. <https://translate.google.ru/>

**Thank you for your
attention!**

