

Exercices d'Optique

« (...) que mon corps est le prisme inaperçu, mais vécu, qui réfracte le monde aperçu vers mon « Je ». Ce double mouvement de conscience, à la fois centrifuge et centripète, qui me relie au monde, transforme celui-ci par là même, lui donne une détermination, une qualification nouvelle. »

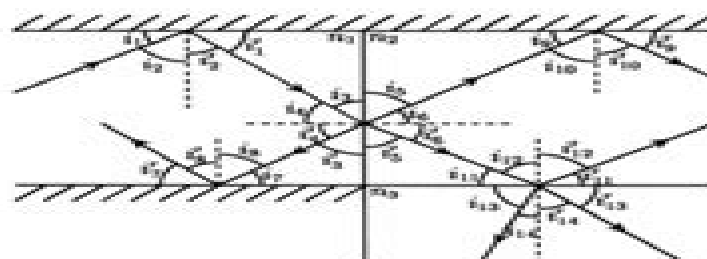
Edmond BARBOTIN – *Humanité de l'homme* Aubier, p. 48 (1970)

■ Lois de Snell-Descartes

Ex-O1.1 Mise en jambes

1) Refaire le schéma ci-contre en ne laissant que les rayons lumineux existant réellement.

2) Donner toutes les relations angulaires possibles en précisant pour chacune si elle est d'origine géométrique ou optique.



01

Ex-O1.2 La loi de la réfraction

Un rayon lumineux dans l'air tombe sur la surface d'un liquide; il fait un angle $\alpha = 56^\circ$ avec le plan horizontal.

La déviation entre le rayon incident et le rayon réfracté est $\theta = 13,5^\circ$. Quel est l'indice n du liquide?

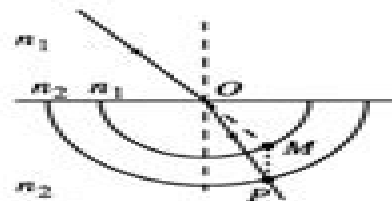
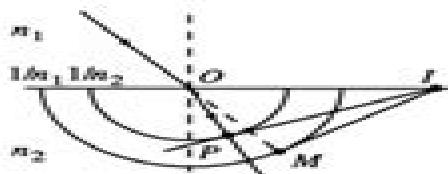
Rép. : $n = 1,6$.

Ex-O1.3 Constructions de Descartes et de Huygens

Montrer que les deux constructions suivantes permettent de tracer le rayon réfracté.

1) Construction de Descartes :

- tracer les cercles de rayons n_1 et n_2 ;
- soit M l'intersection du rayon incident avec le cercle de rayon n_1 ;
- soit P l'intersection du cercle de rayon n_2 et de la droite orthogonale à la surface de séparation passant par M ;
- le rayon réfracté n'est autre que OP .



2) Construction de Huygens :

- tracer les cercles de rayons $1/n_1$ et $1/n_2$;
- soit M l'intersection du rayon incident avec le cercle de rayon $1/n_1$;
- tracer la tangente en M au cercle de rayon $1/n_1$;
- soit I le point d'intersection de la tangente avec la surface de séparation;
- soit P l'intersection du cercle de rayon $1/n_2$ et de la seconde tangente tracée;
- le rayon réfracté n'est autre que OP .

Ex-O1.4 Dispersion par le verre

Le tableau ci-contre donne les longueurs d'onde, dans le vide, de deux radiations monochromatiques et les indices correspondants pour deux types de verre différents.

1) Calculer les fréquences de ces ondes lumineuses. Dépendent-elles de l'indice du milieu?

On prendra $c_0 = 2,998 \cdot 10^8 \text{ m.s}^{-1}$.

Couleur	λ_0 (nm)	n (crown)	n (flint)
rouge	656,3	1,504	1,612
bleu	486,1	1,521	1,671

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