

# Exercices d'Optique

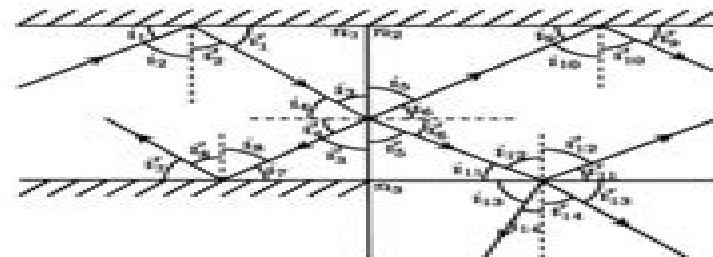
« (...) que mon corps est le prisme inaperçu, mais vécu, qui réfracte le monde aperçu vers mon « Je ». Ce double mouvement de conscience, à la fois centrifuge et centripète, qui me relie au monde, transforme celui-ci par là même, lui donne une détermination, une qualification nouvelle. »

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.



O1

### 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?

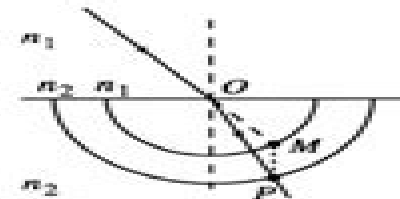
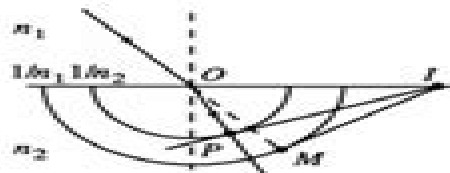
Rép. :  $n = 1,6$ .

### 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	$\lambda_0$ (nm)	$n$ (crown)	$n$ (flint)
rouge	656,3	1,504	1,612
bleu	486,1	1,521	1,671

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