

Stereo Vision in Nature

Shree K. Nayar

Columbia University

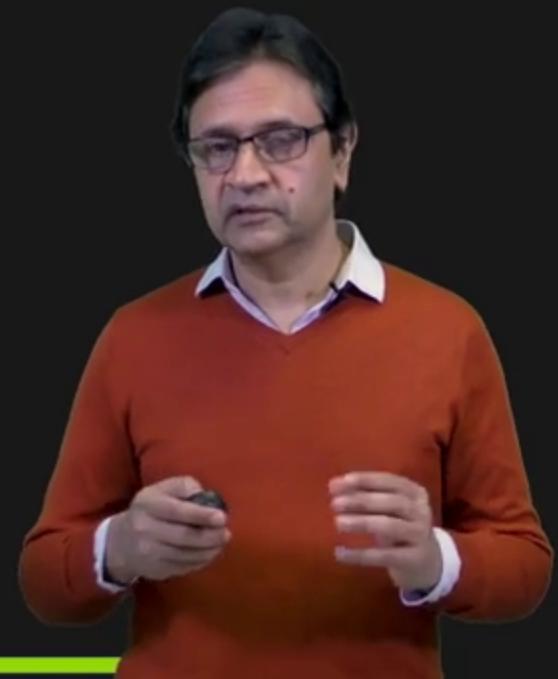
Topic: Uncalibrated Stereo, Module: Reconstruction II

First Principles of Computer Vision

Stereopsis



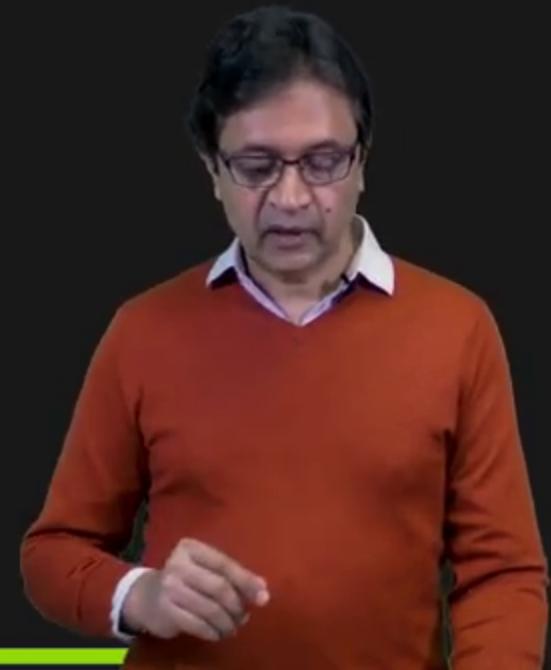
Predator eyes are configured
for depth estimation



Stereopsis



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Predator eyes are configured
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Prey eyes are configured for
larger field of view

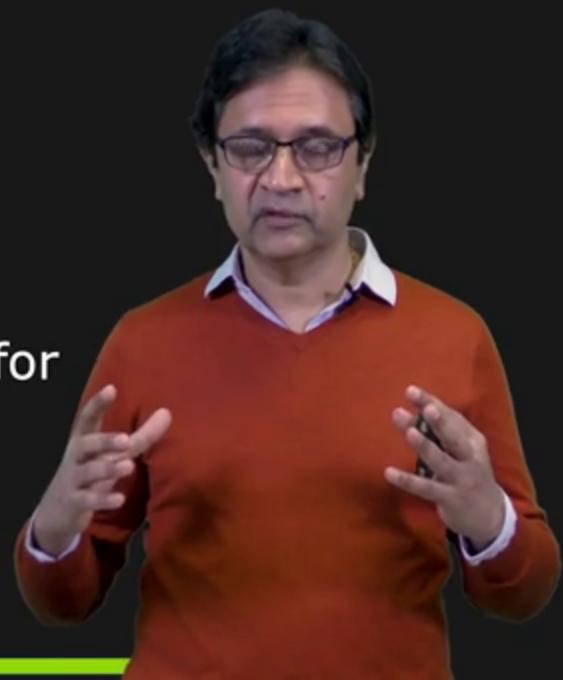


Stereopsis



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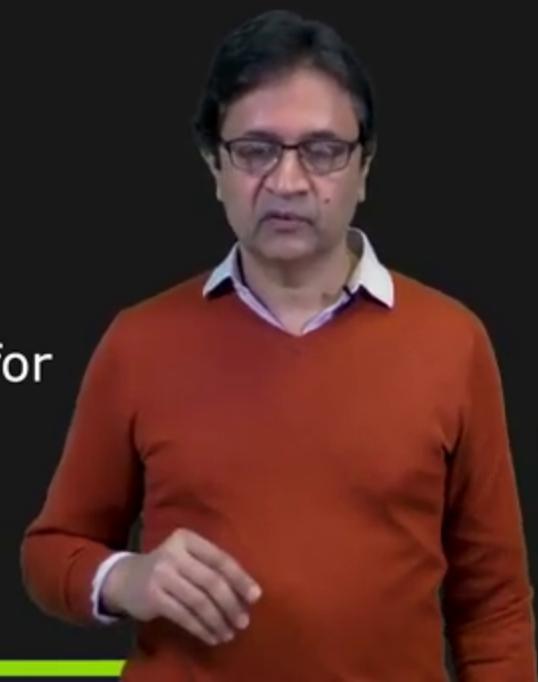


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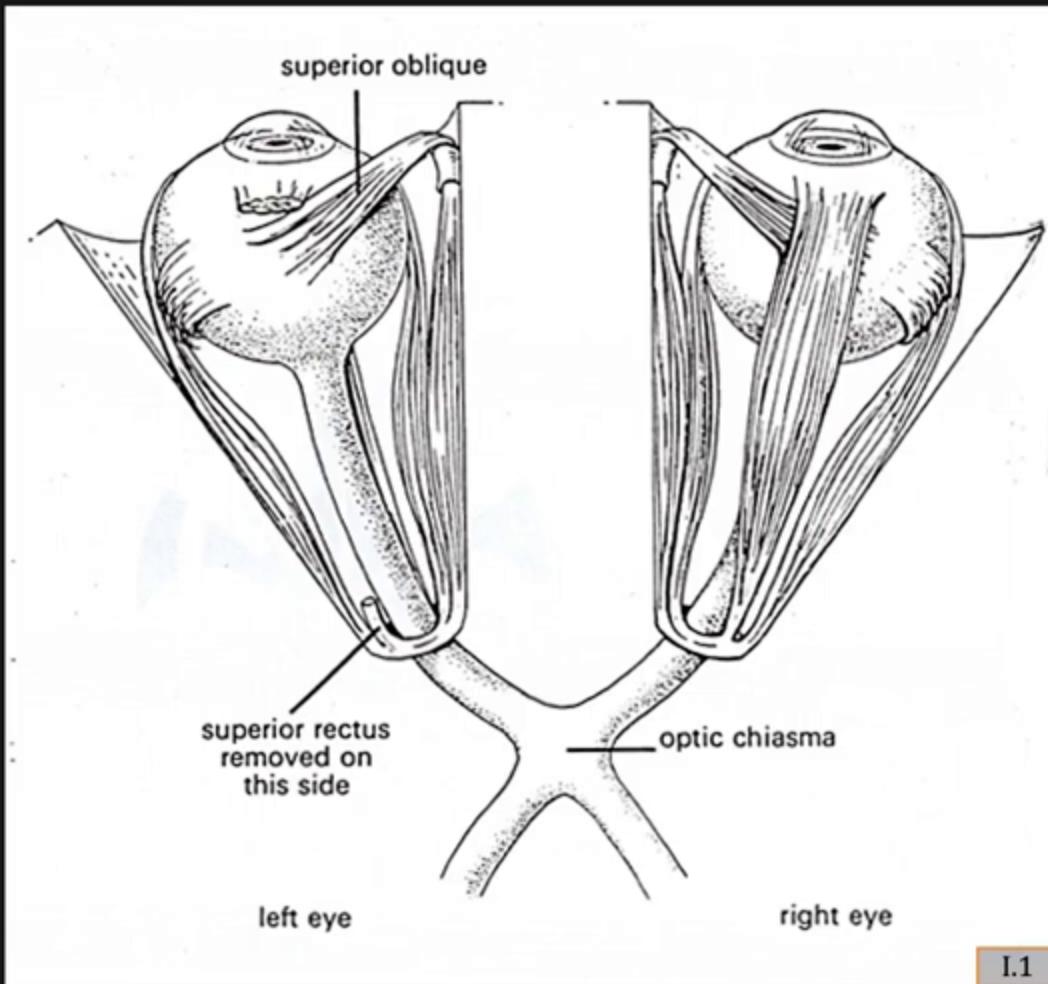


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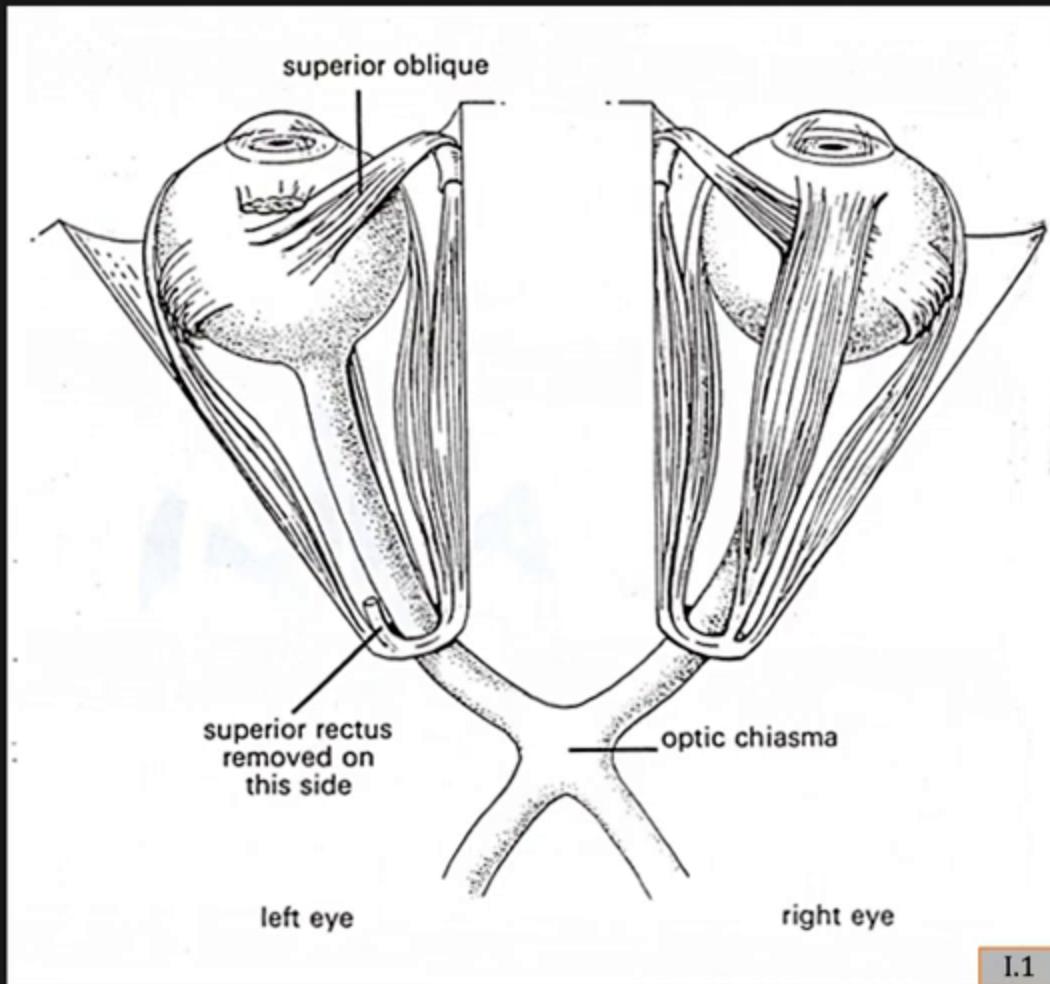
The Human Stereo System



I.1



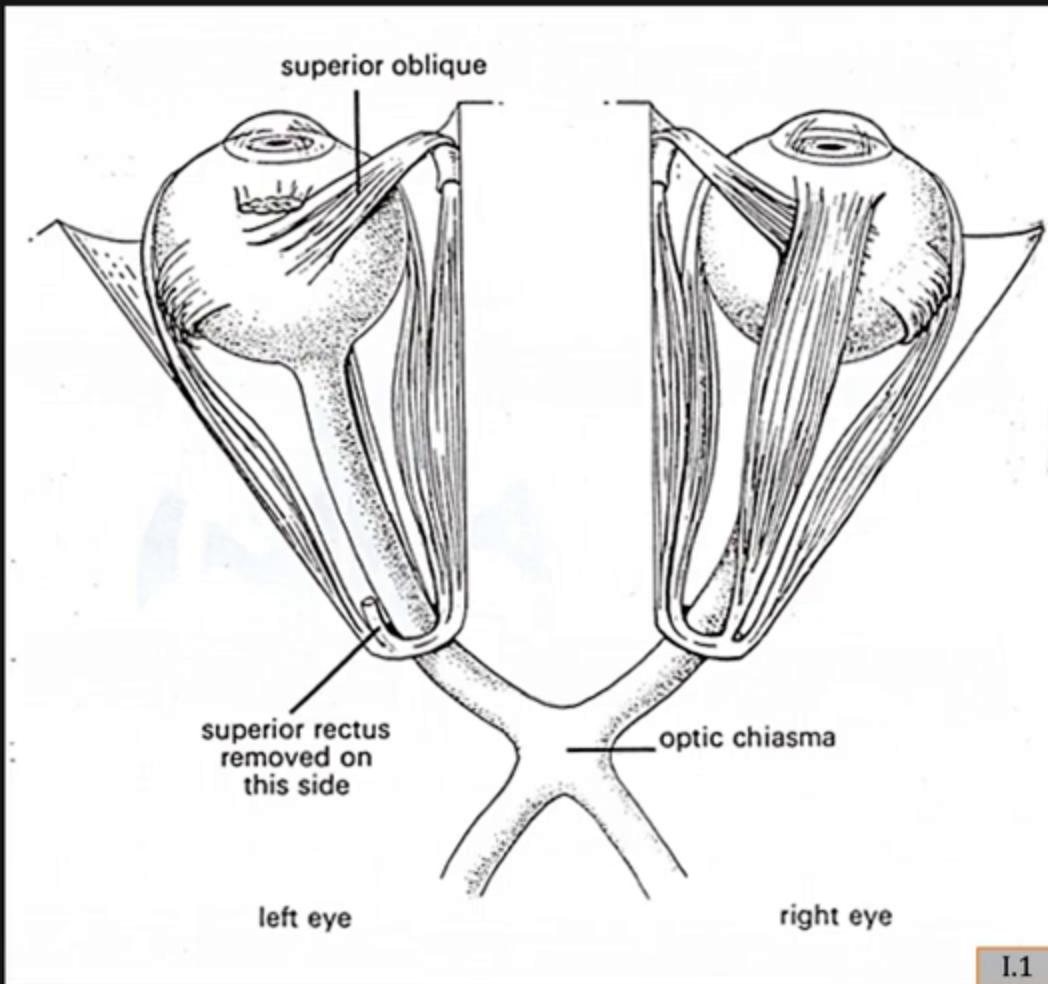
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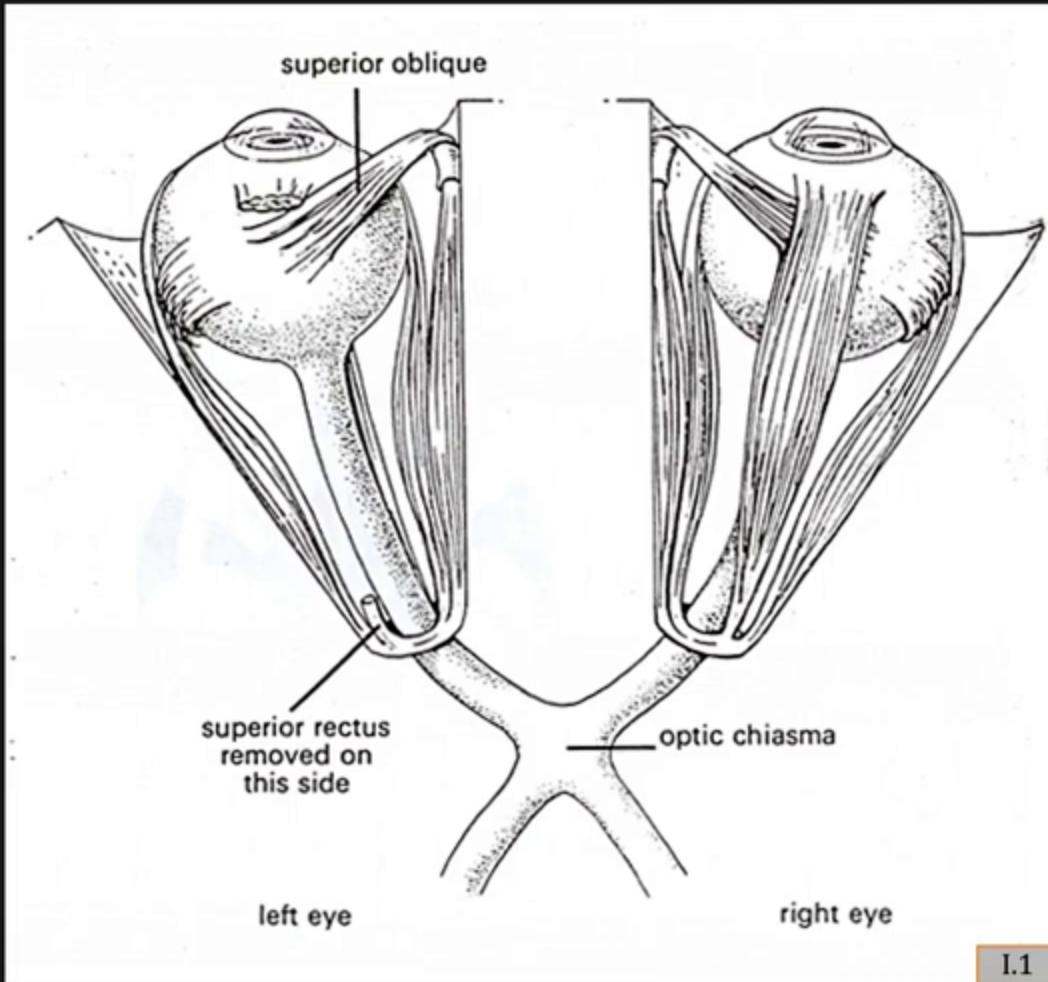
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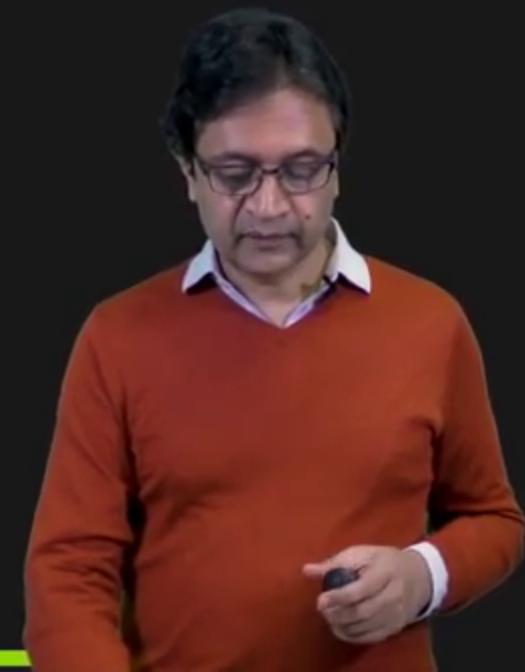
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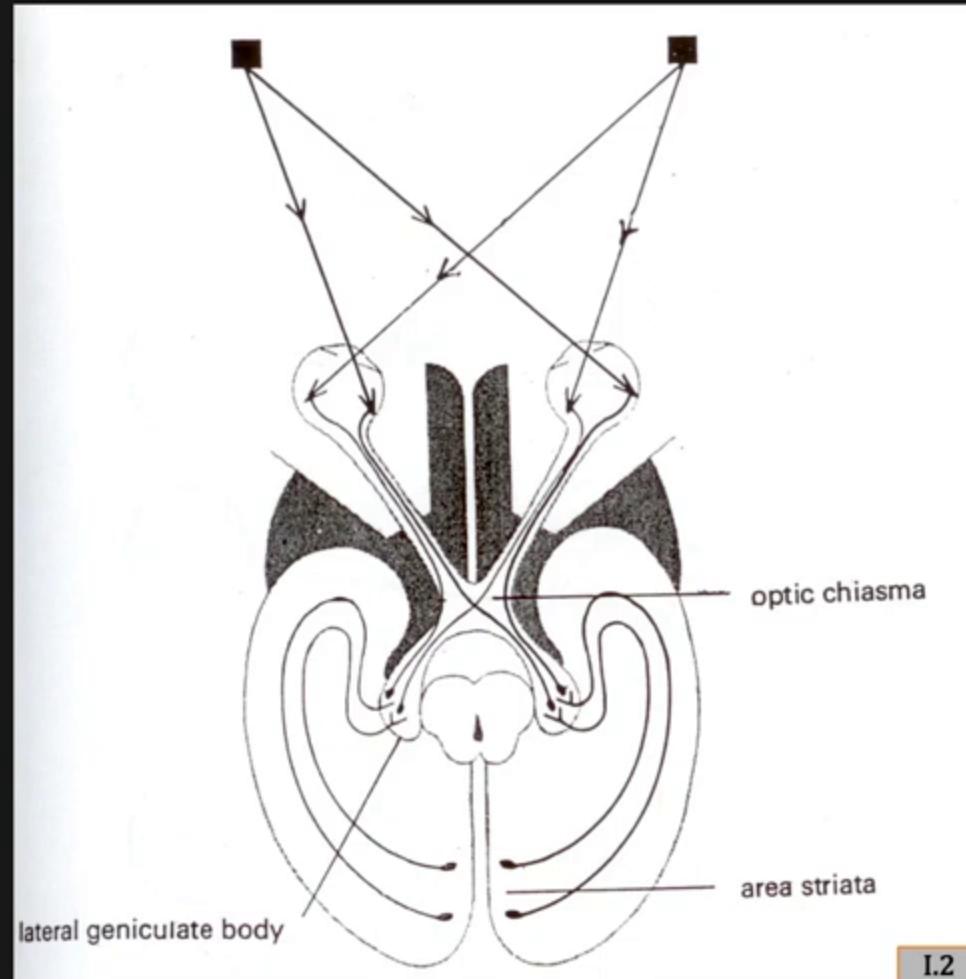
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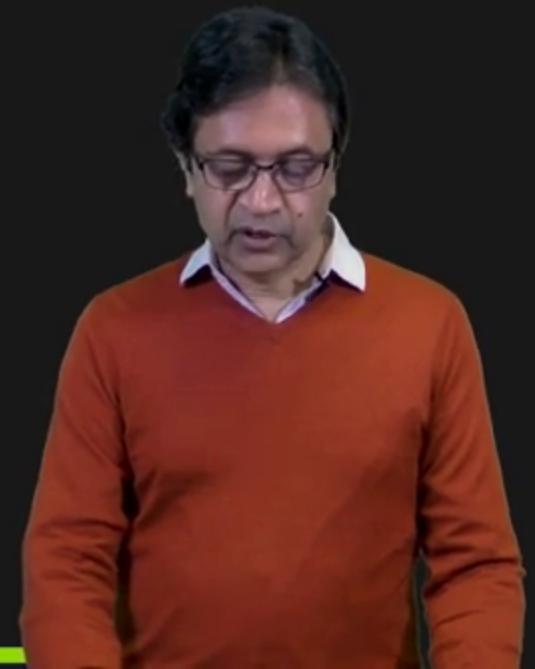
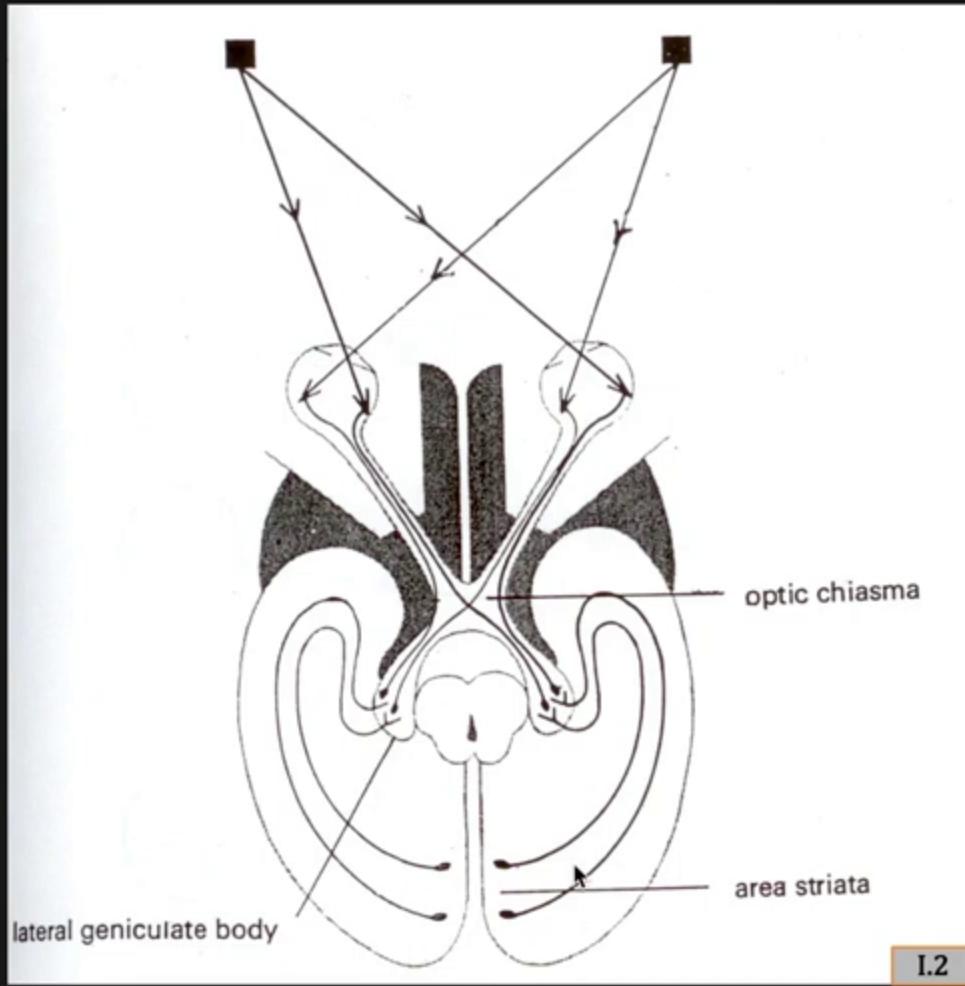
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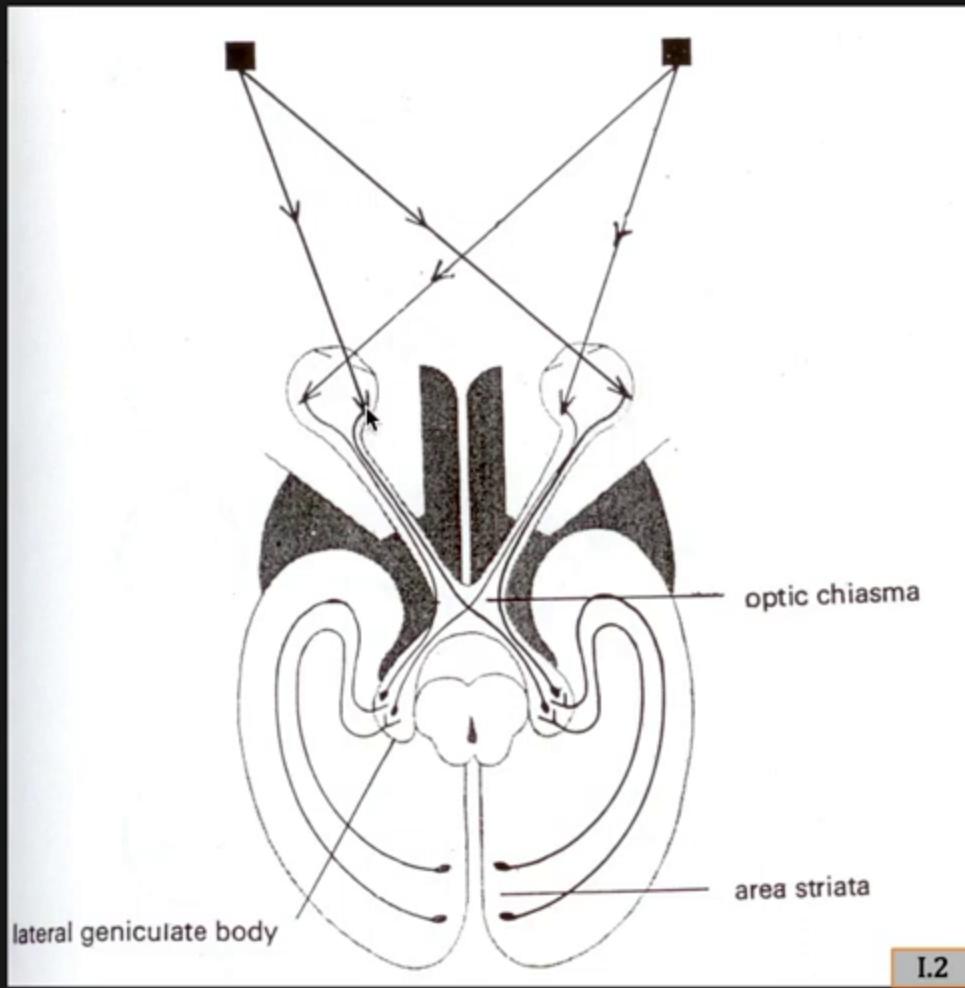
Stereopsis in Humans



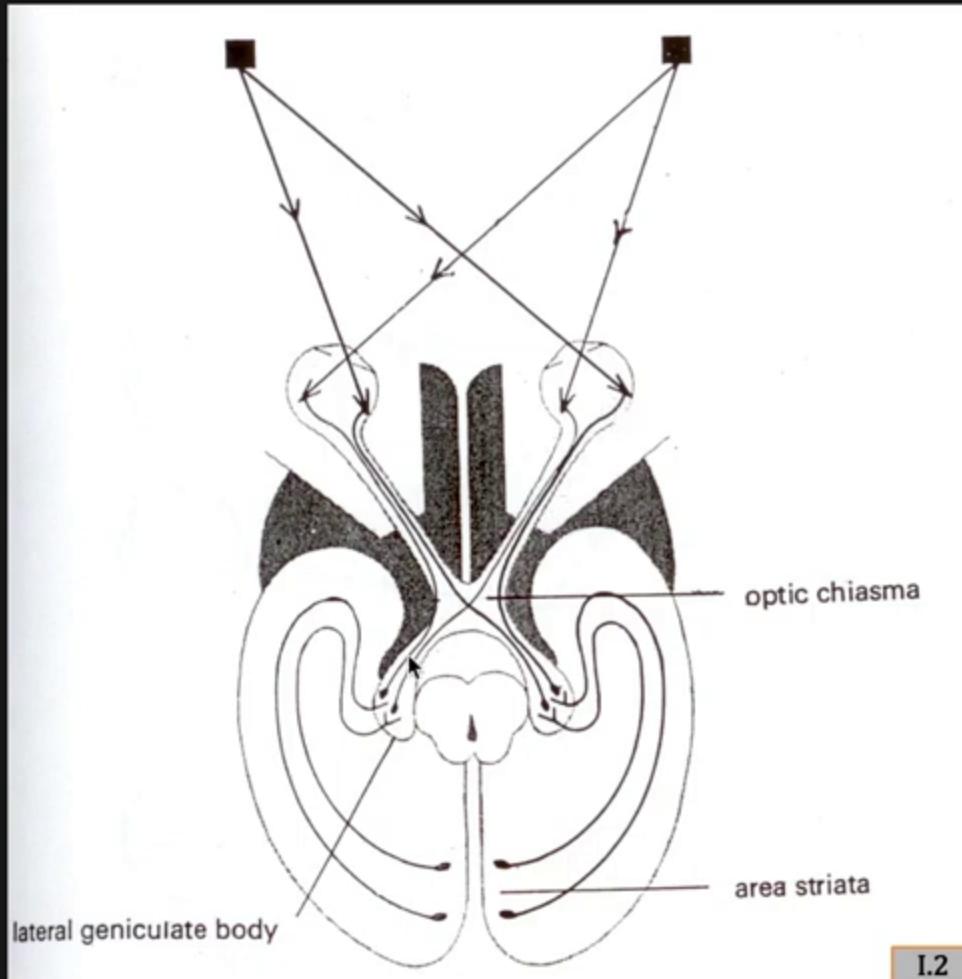
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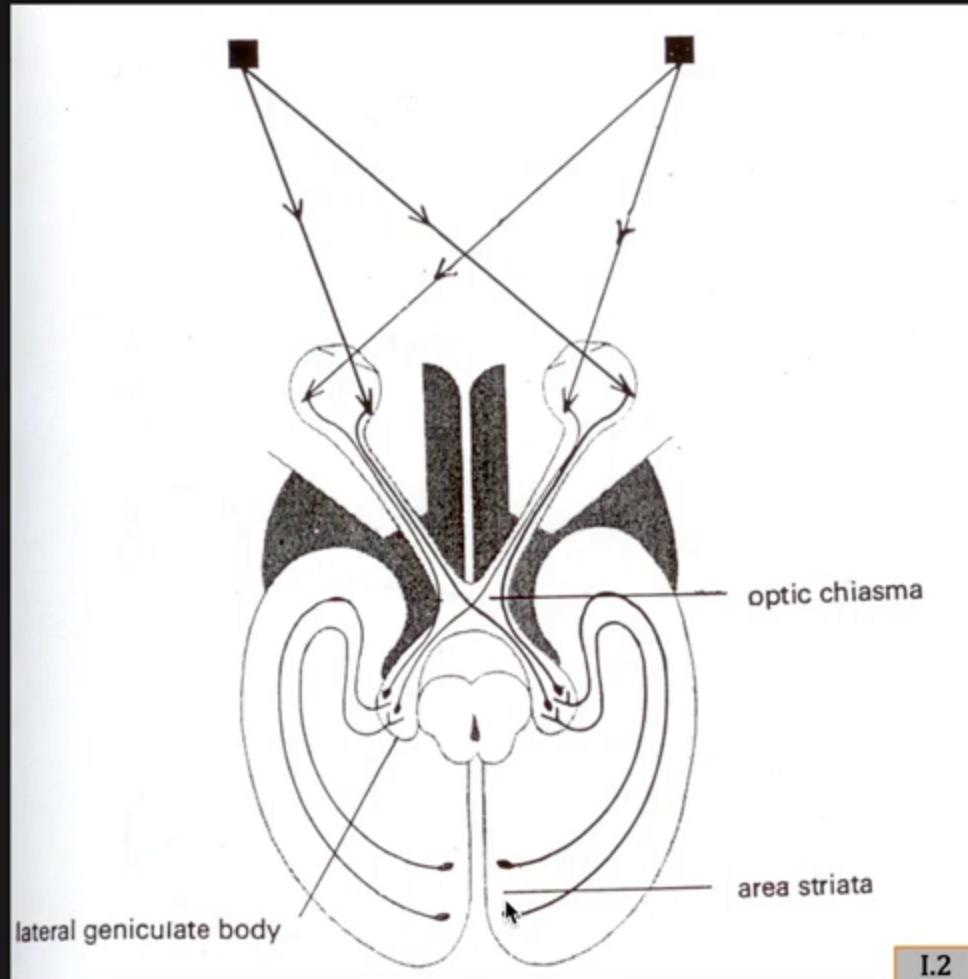
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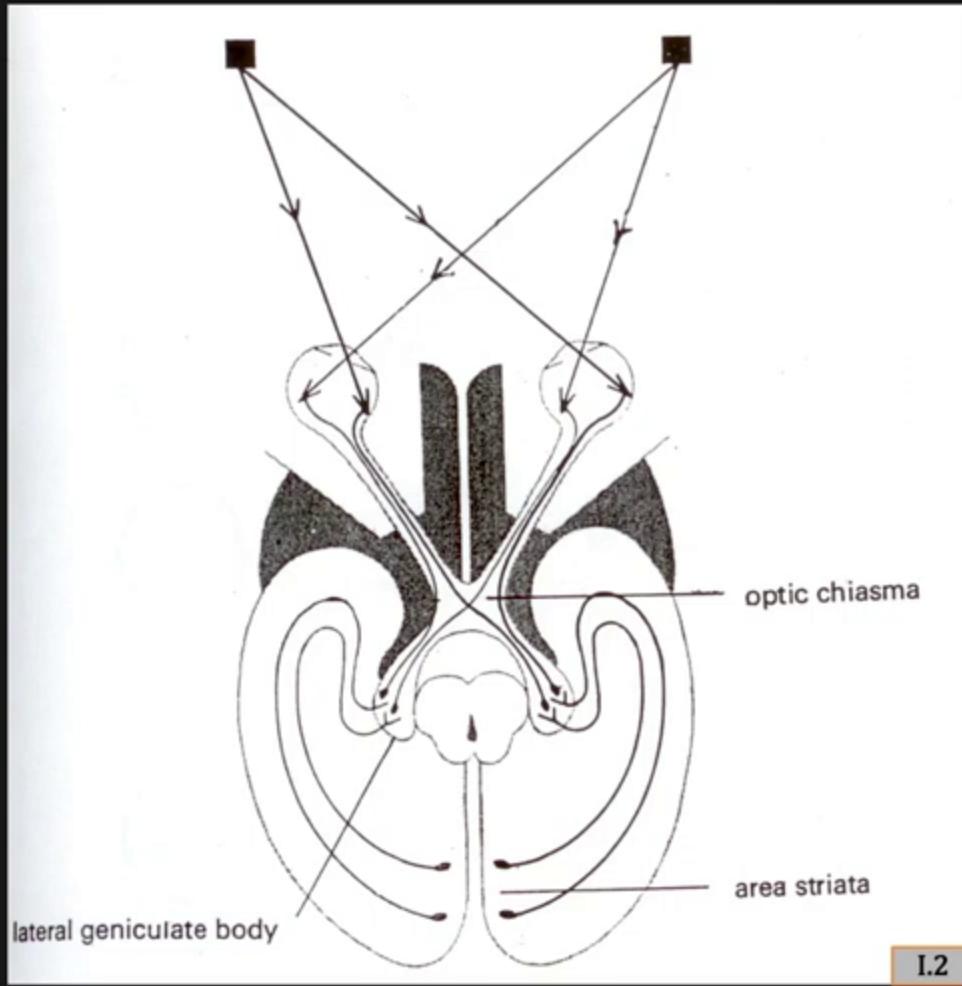
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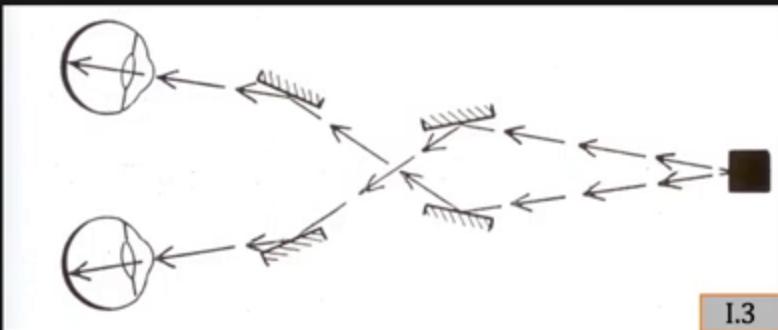


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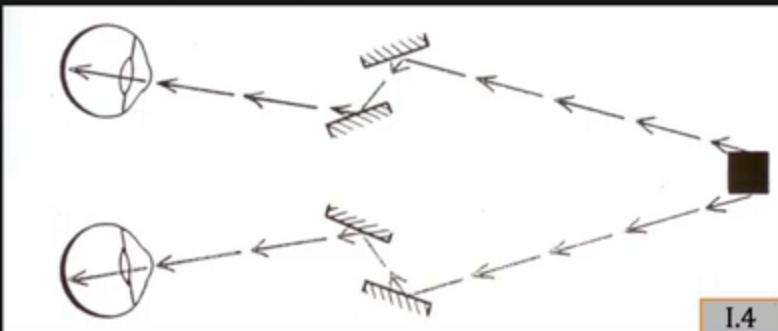
Human Stereo Experiments

A *pseudoscope* gives reversed depth

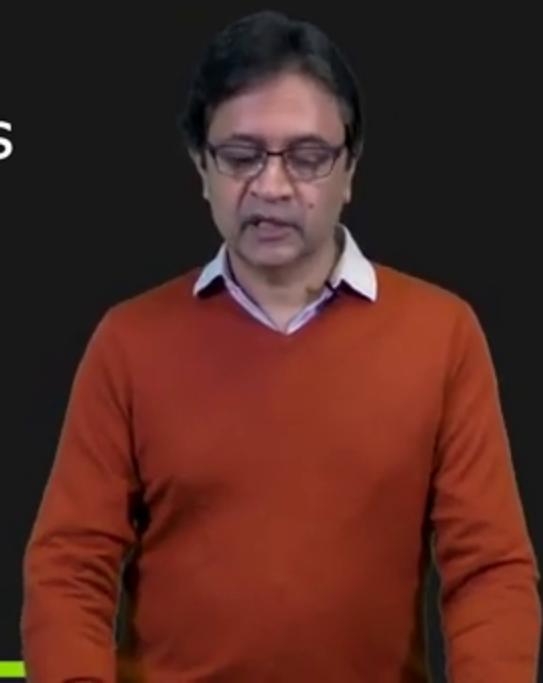


I.3

A *telestereoscope* increases separation of the eyes

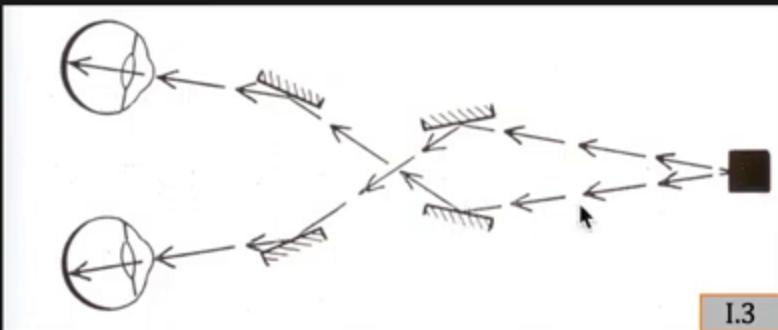


I.4



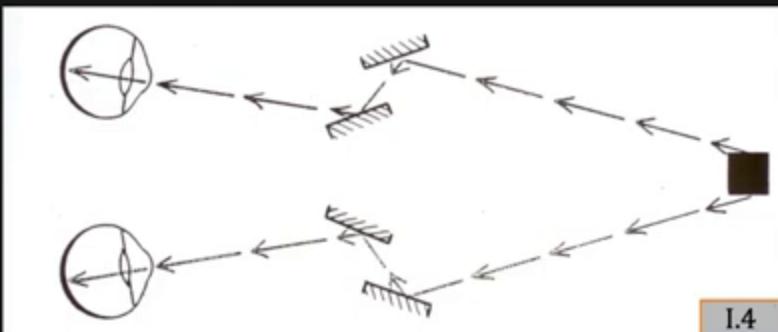
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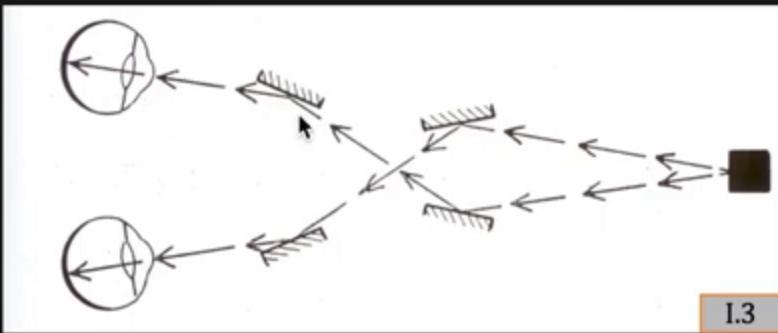


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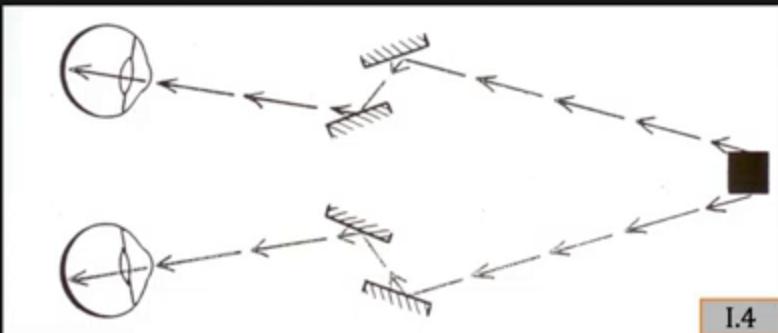
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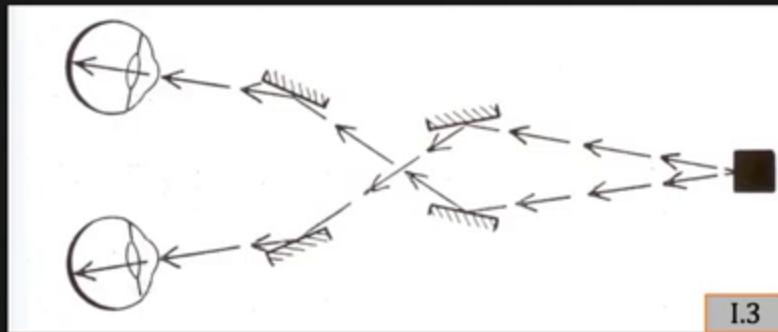


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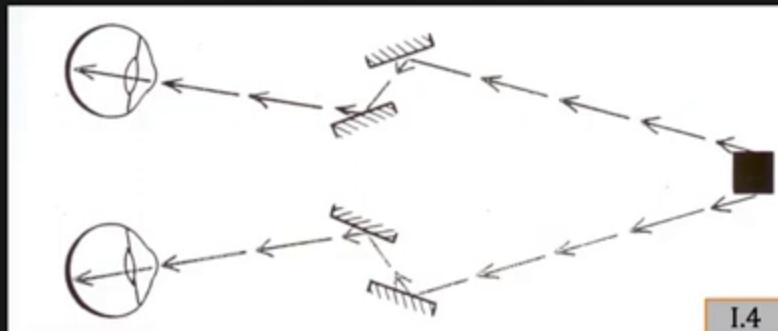
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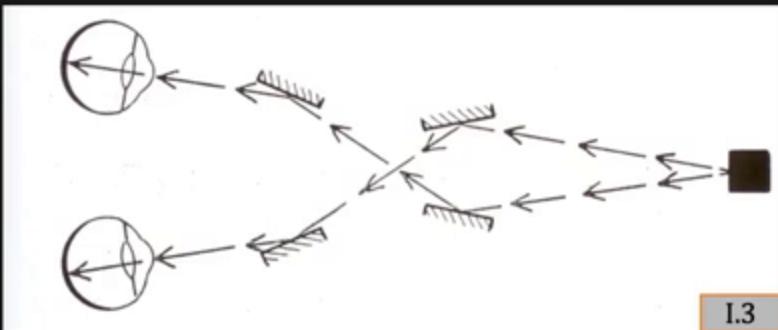


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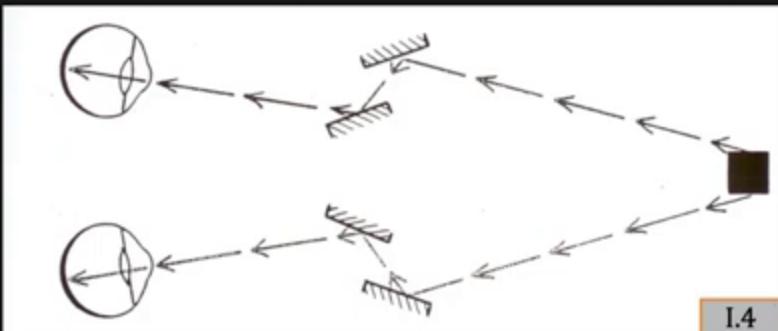
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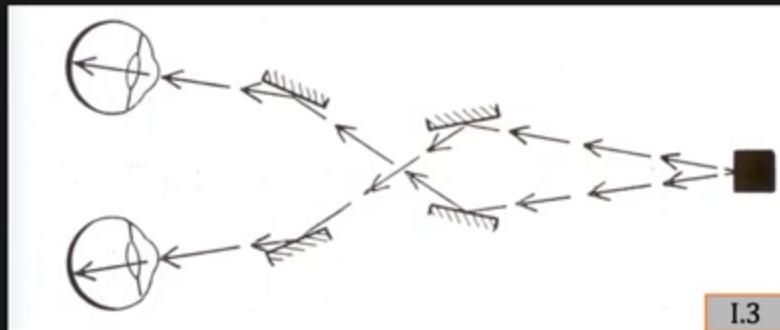


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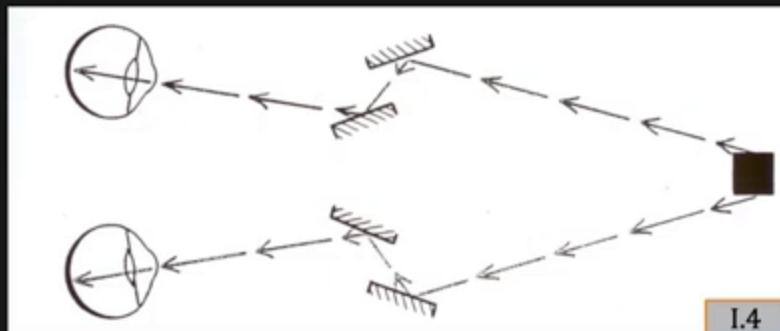
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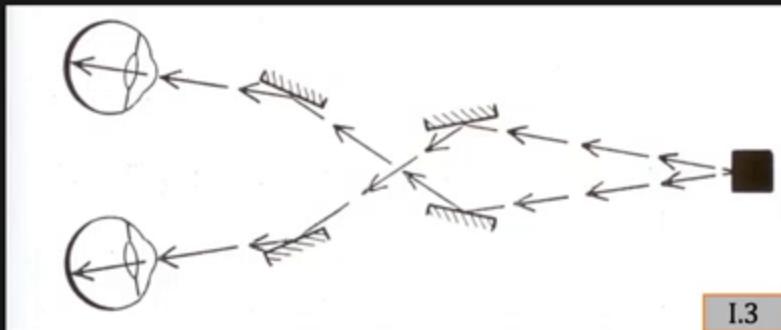


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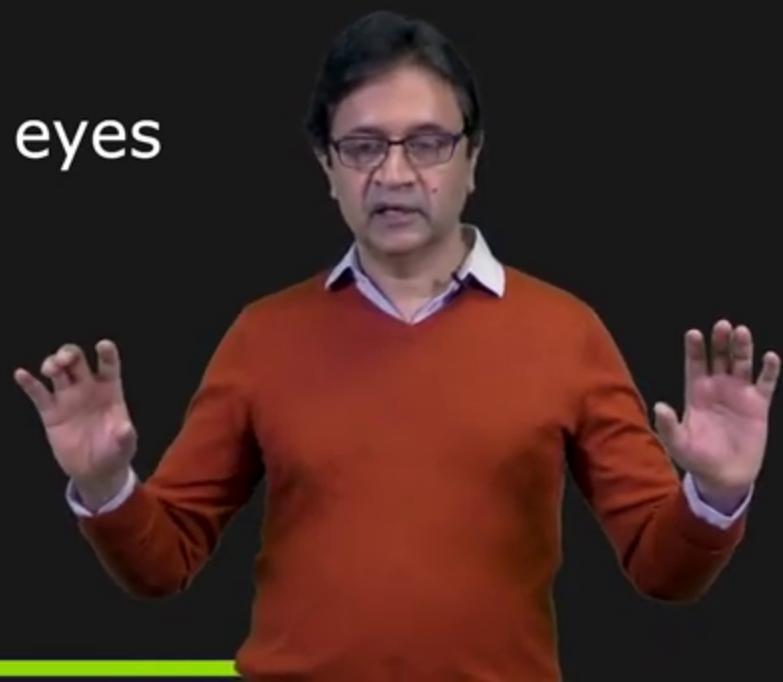
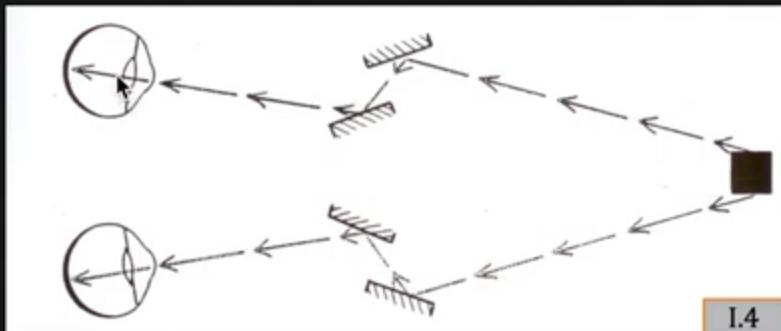


Human Stereo Experiments

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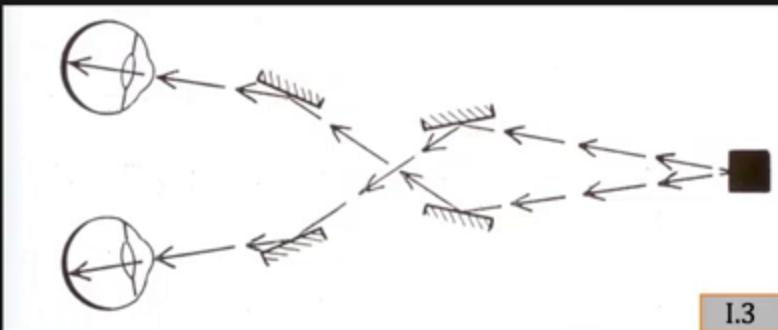


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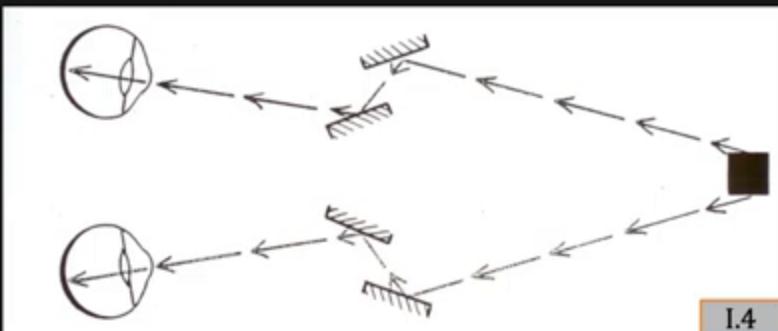
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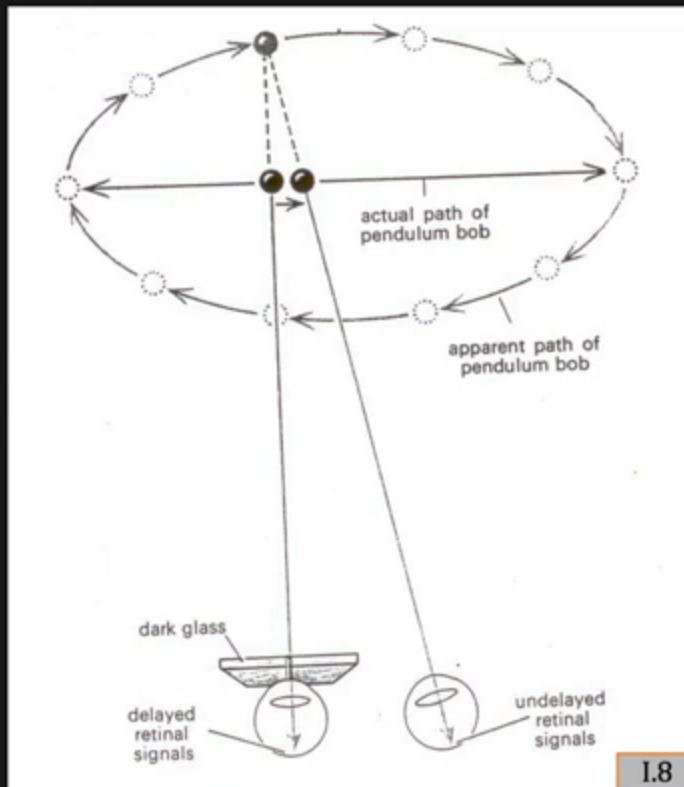
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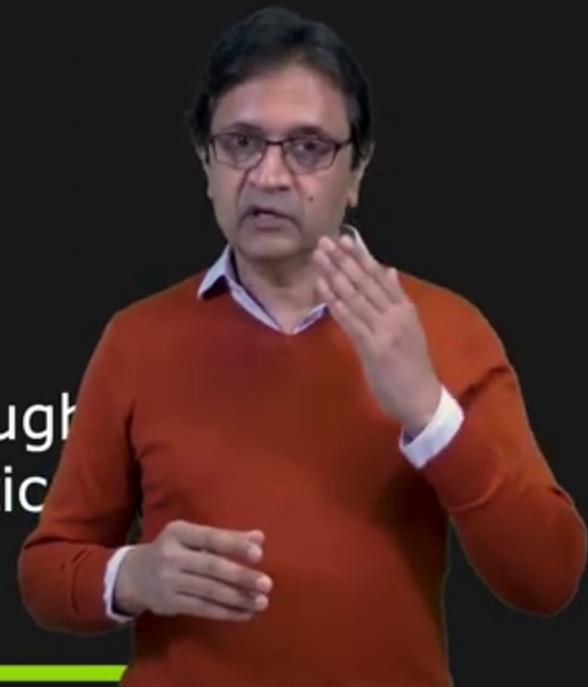


The Pulfrich Pendulum Effect



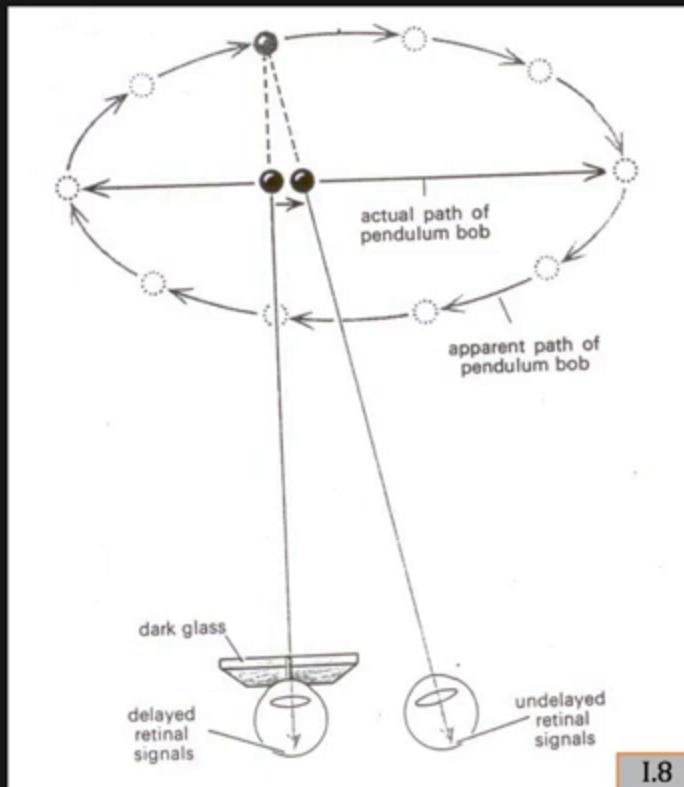
1.8

A pendulum swinging in a straight arc is viewed through dark glass in one eye. The motion appears to be elliptical.

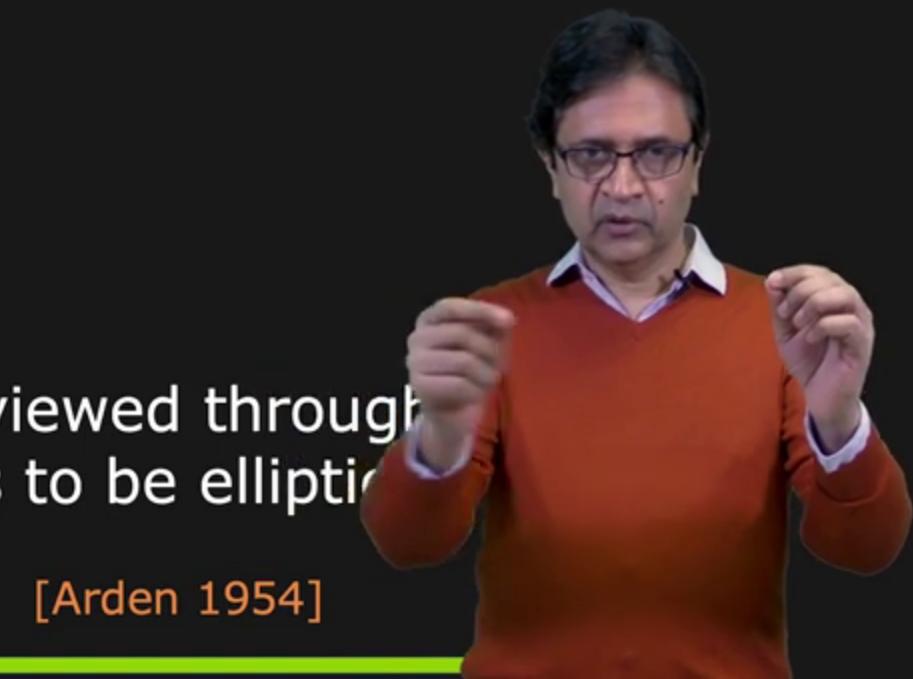


[Arden 1954]

The Pulfrich Pendulum Effect

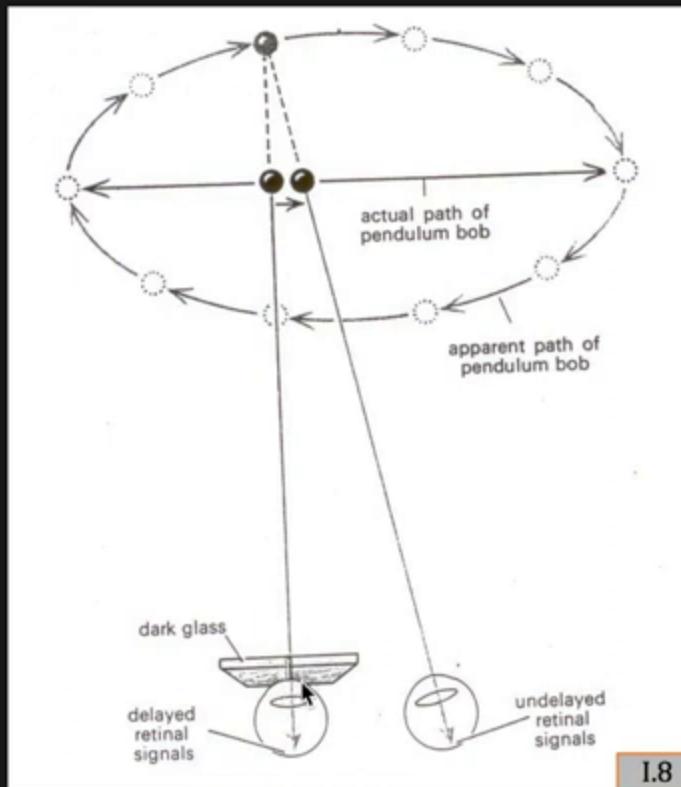


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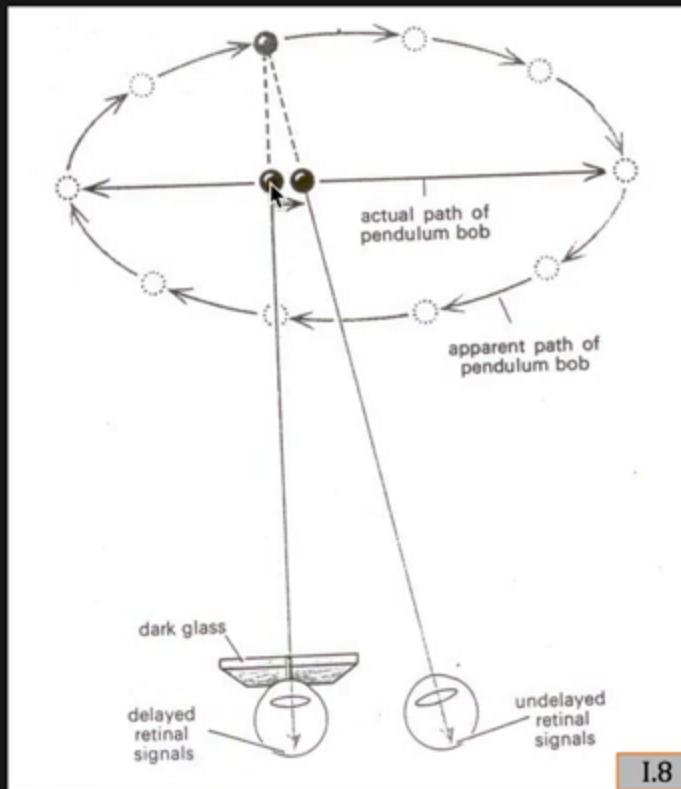


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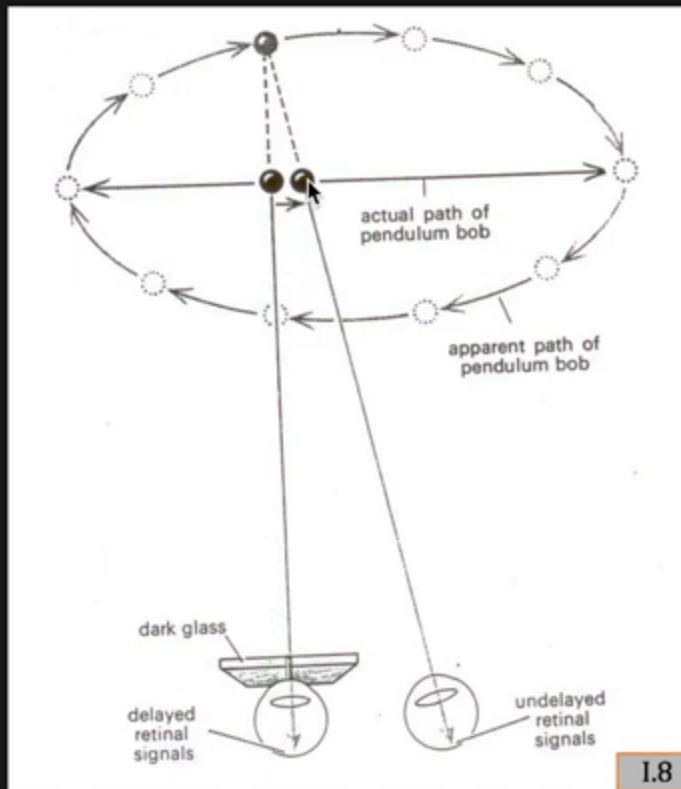


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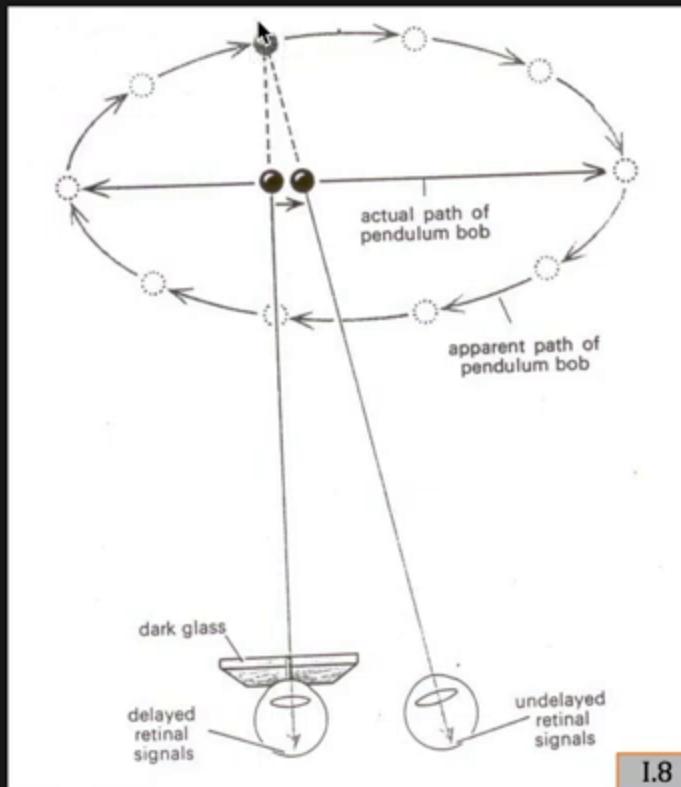


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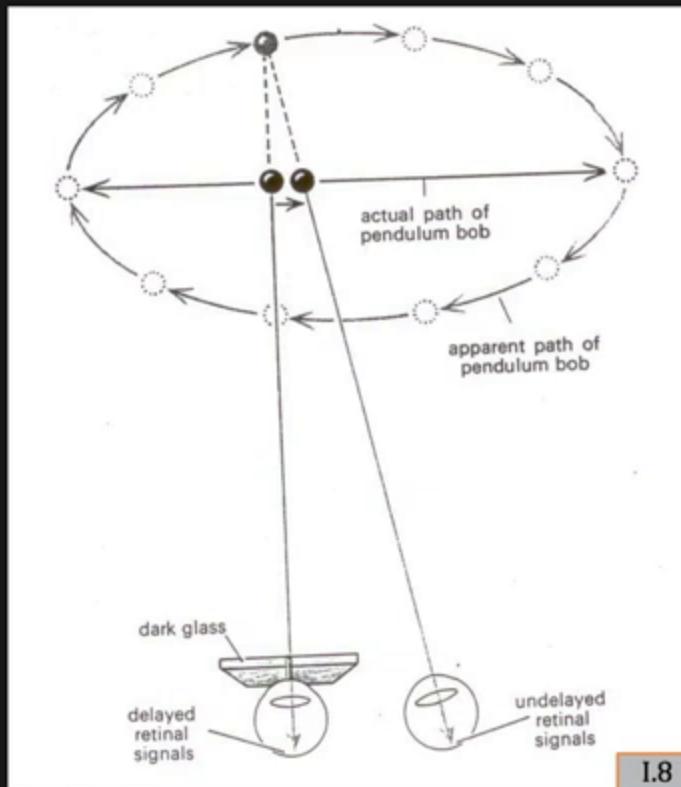


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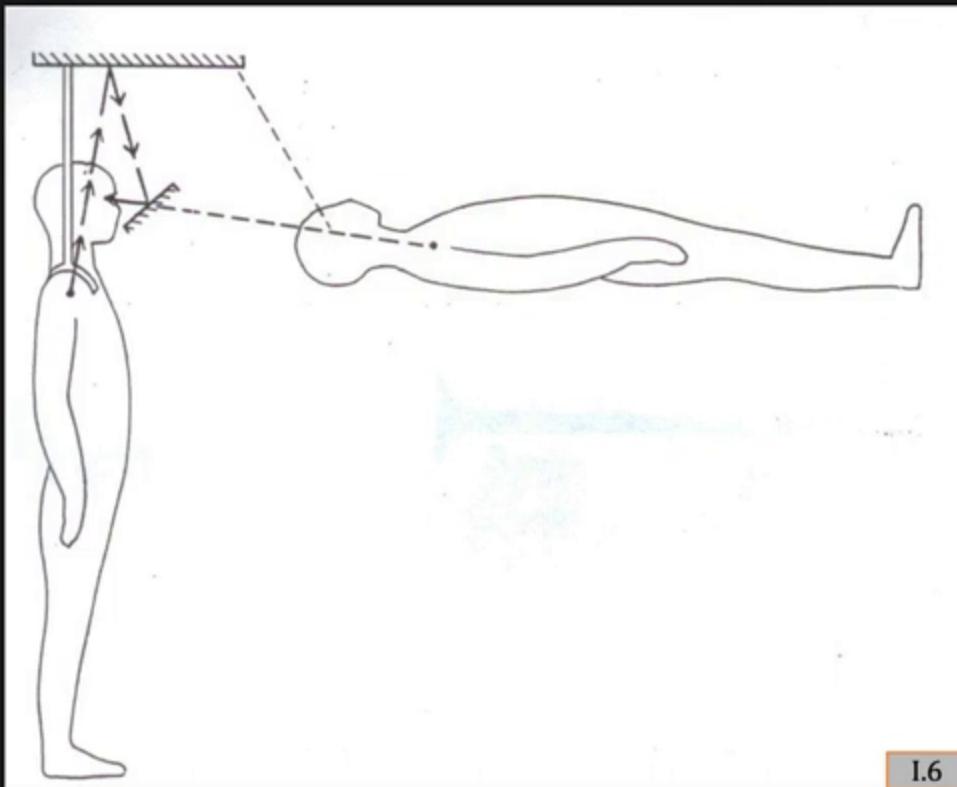


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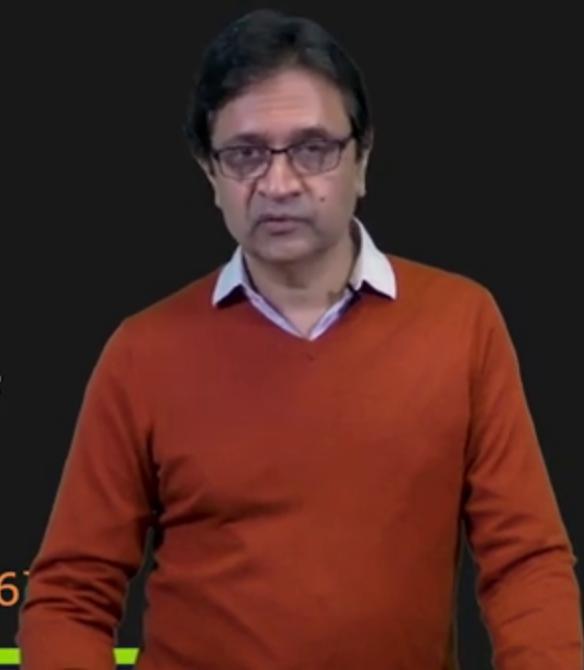
Stratton's Experiment



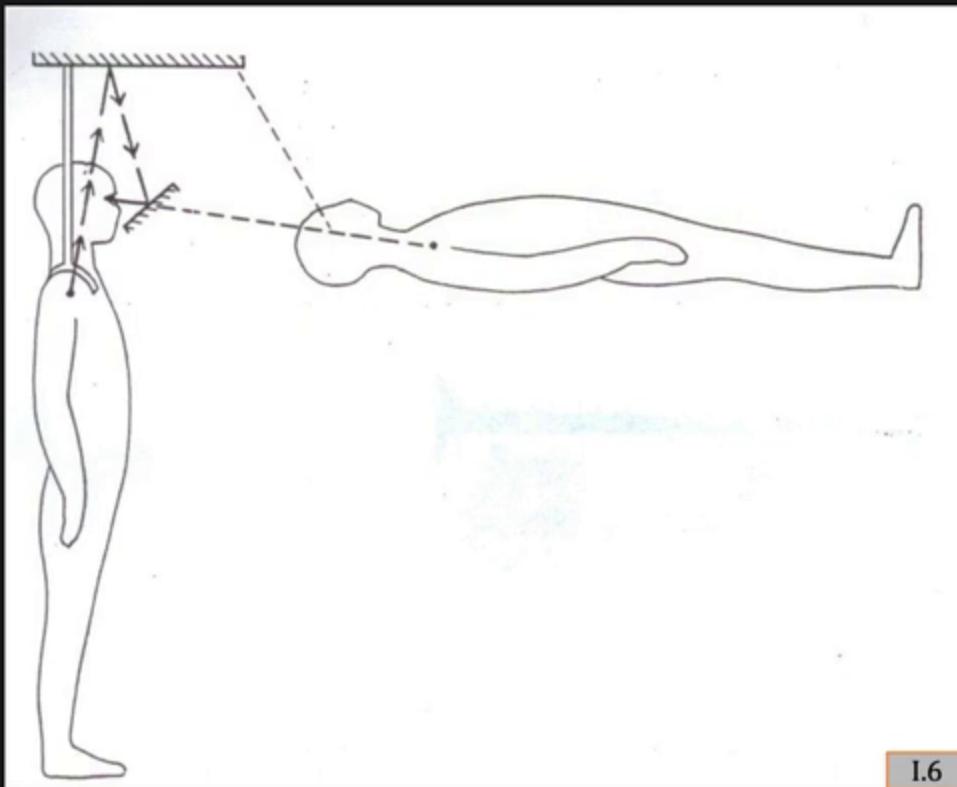
I.6

When wearing this device, Stratton saw himself suspended in space before his eyes.

[Stratton 1896]

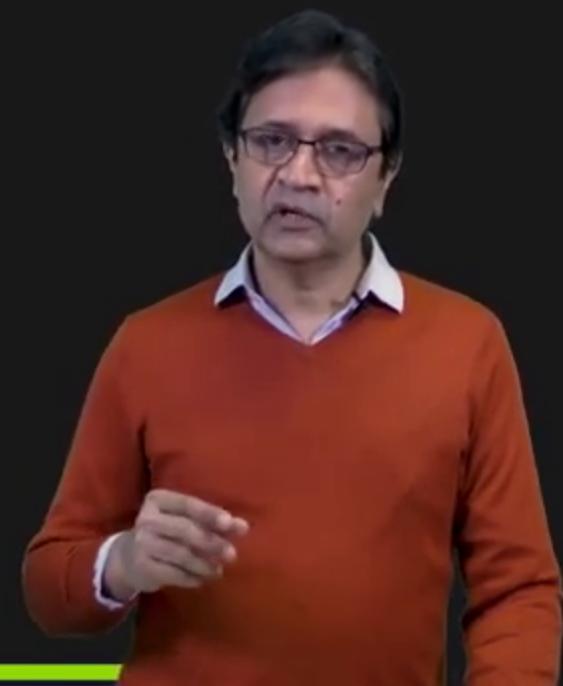


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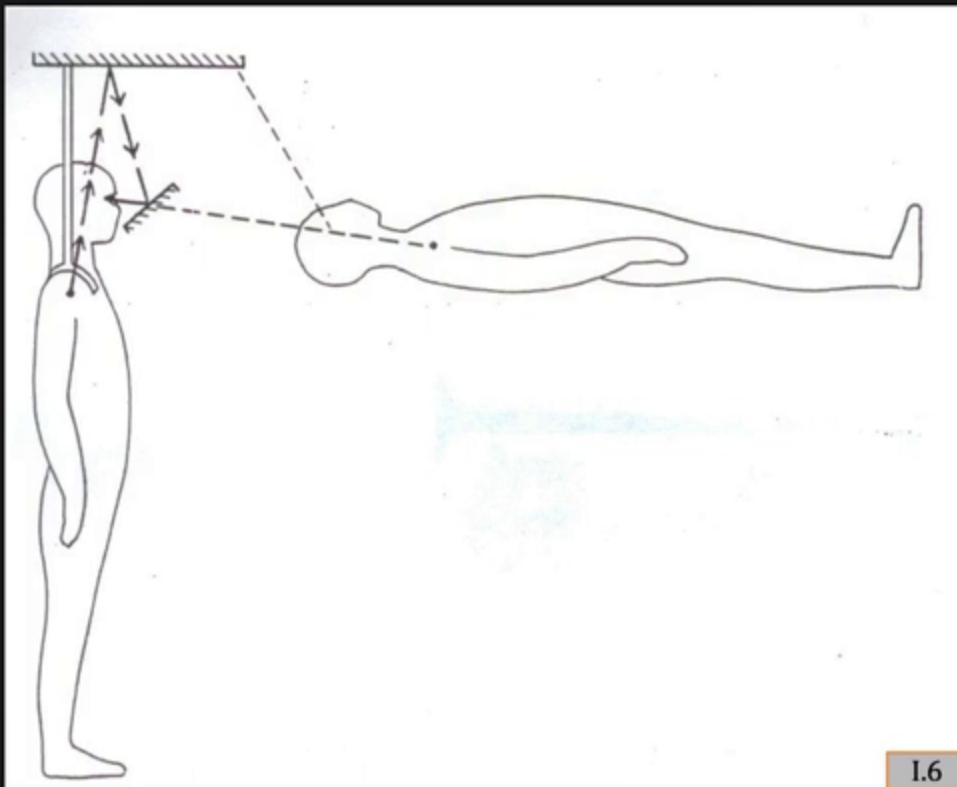


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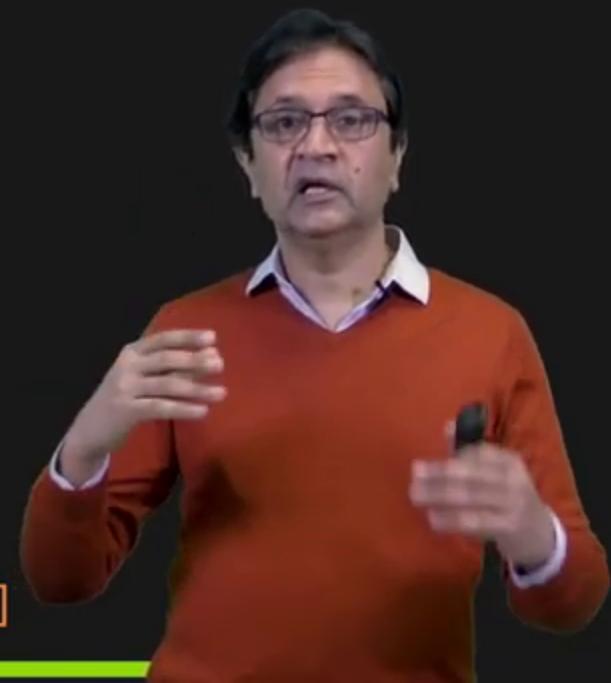


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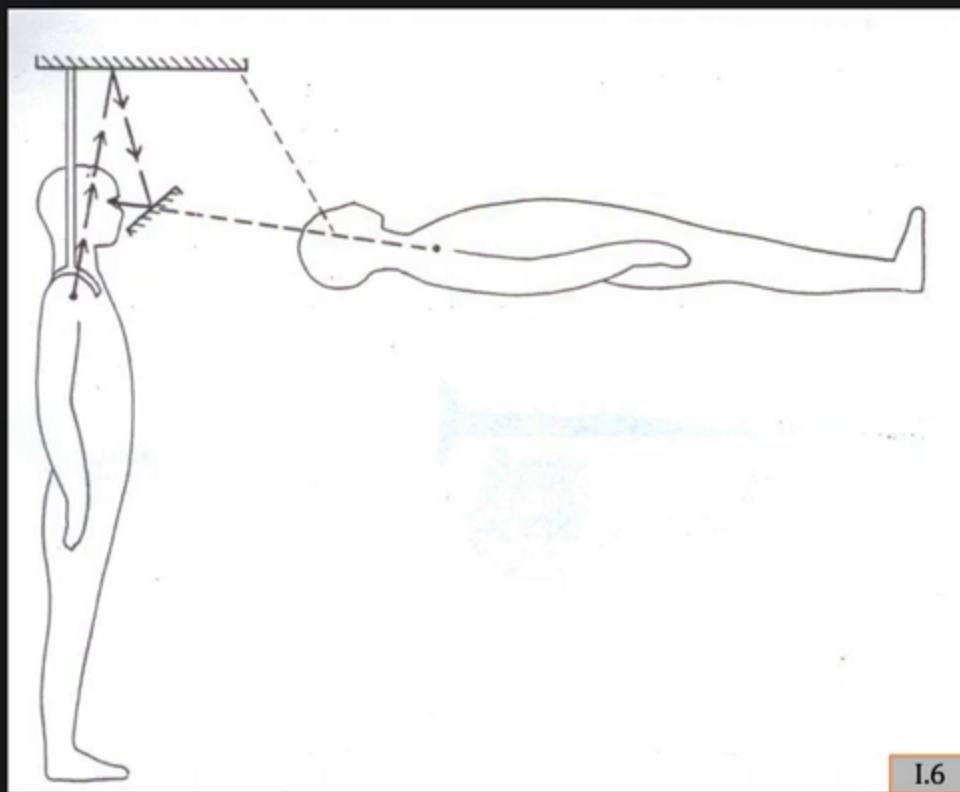


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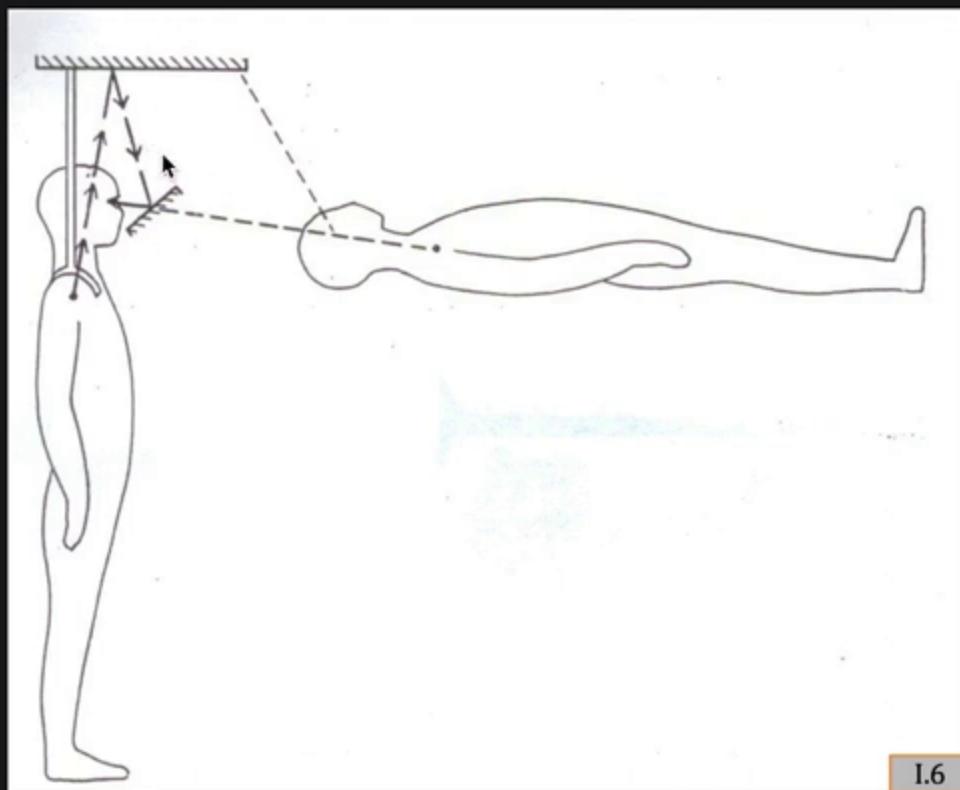


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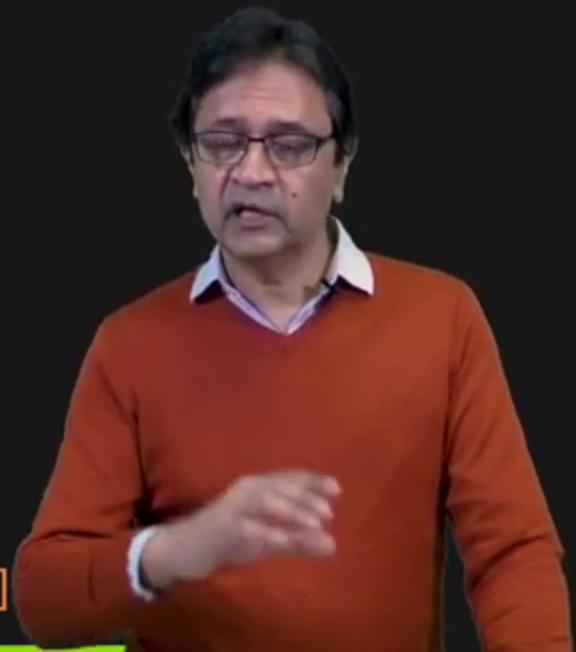


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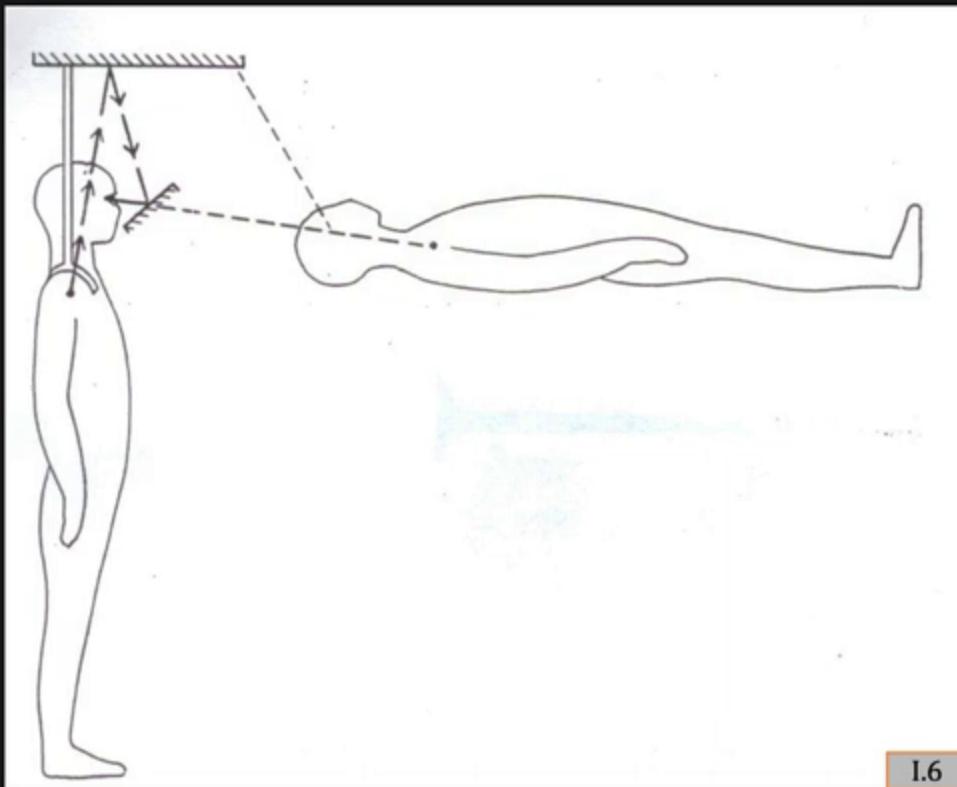


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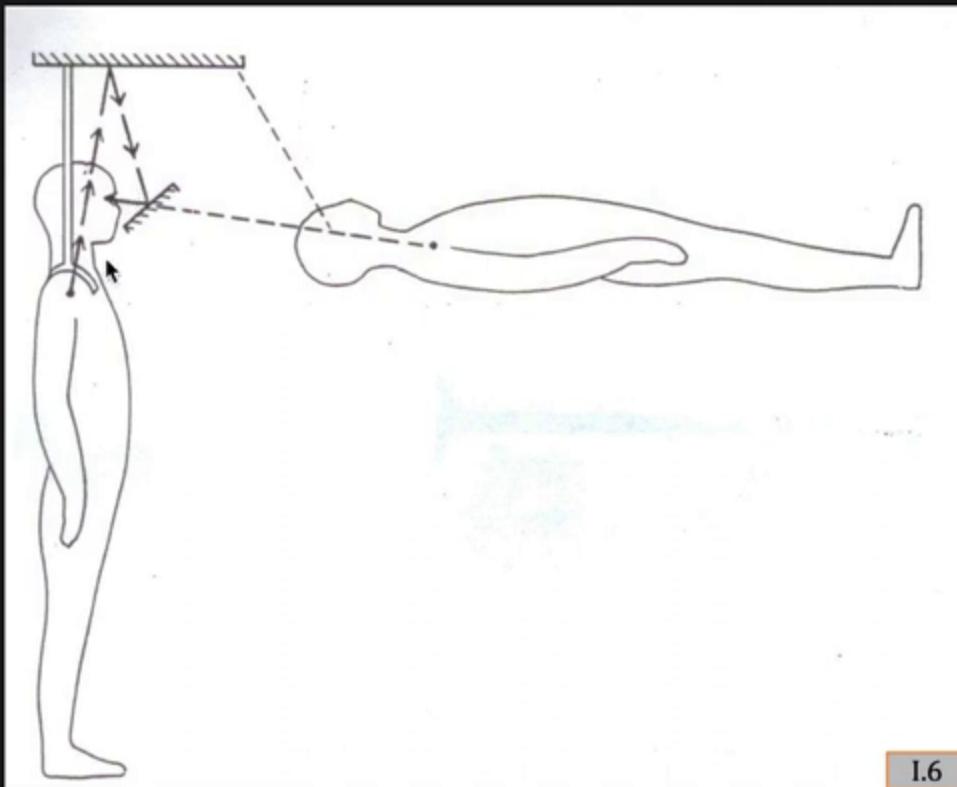
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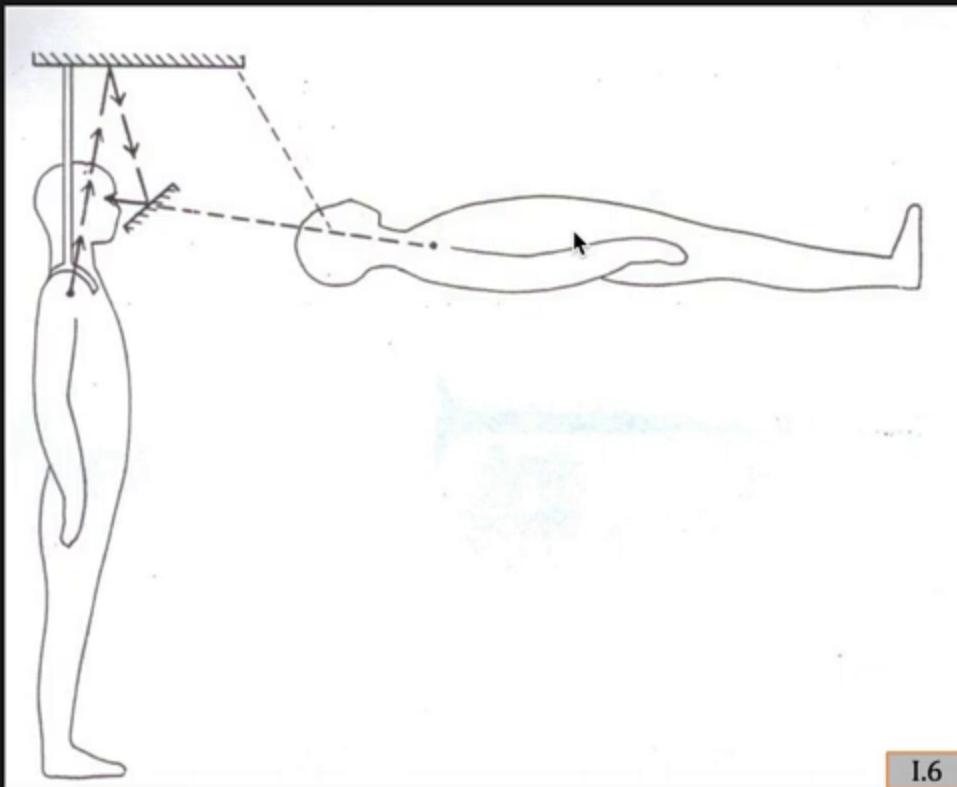


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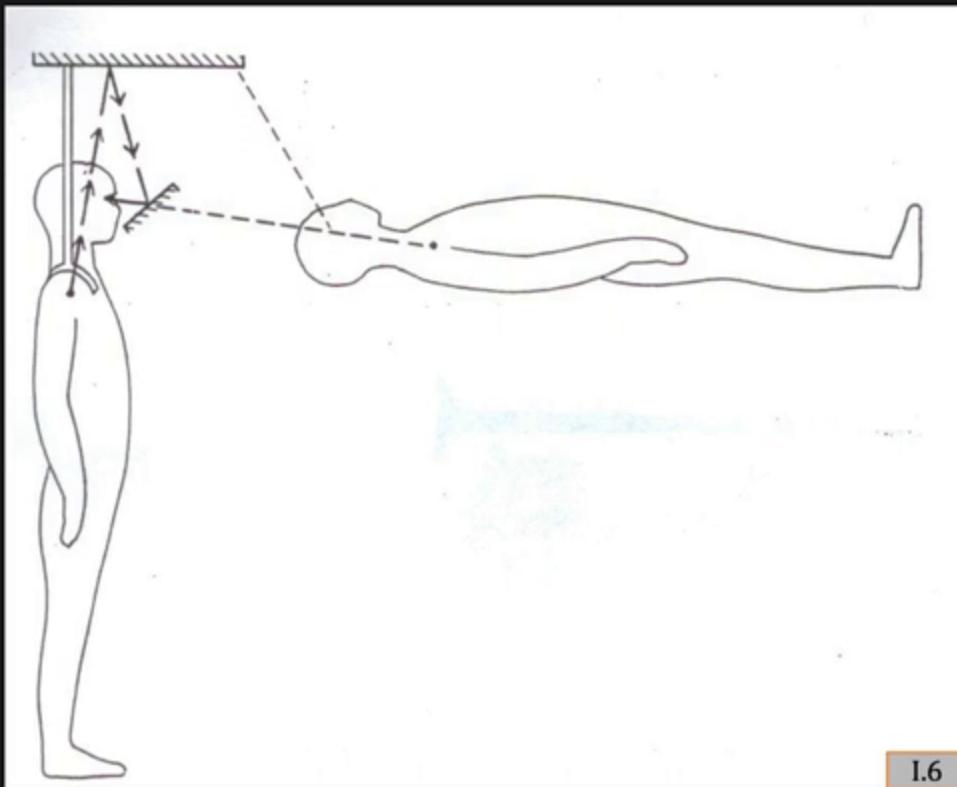


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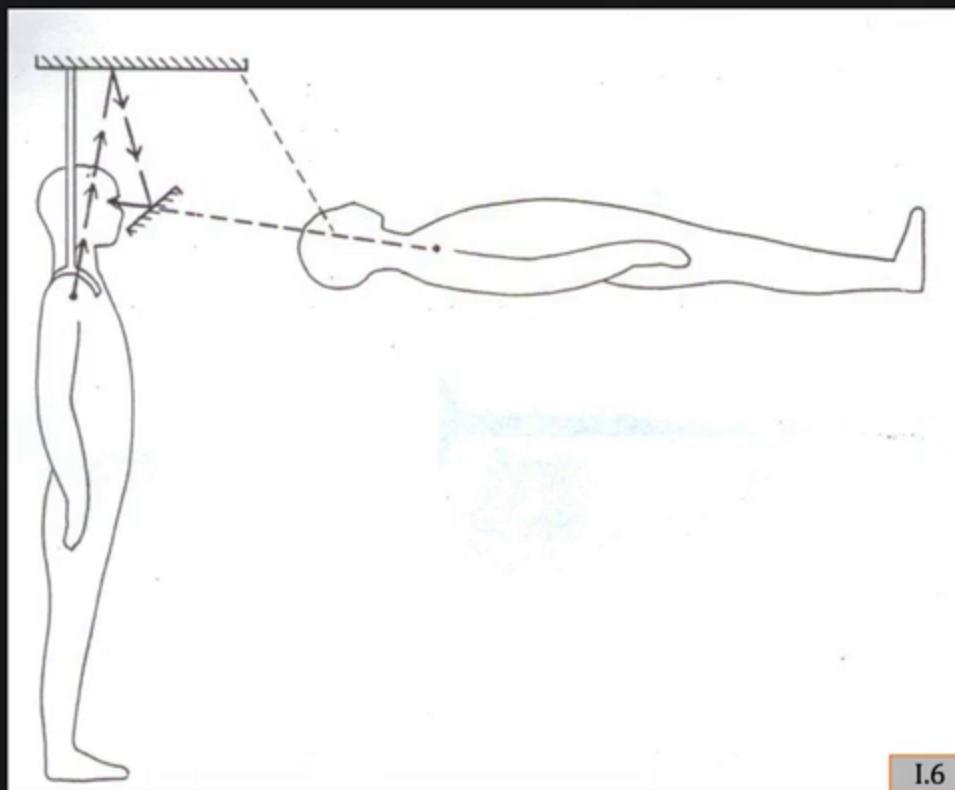
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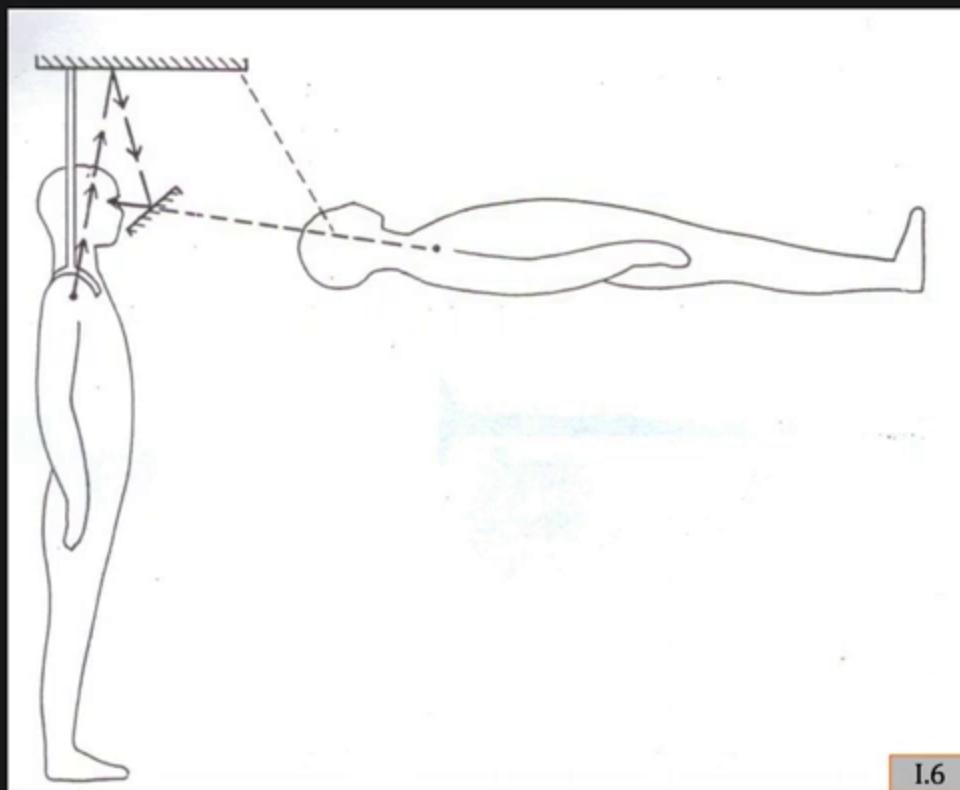


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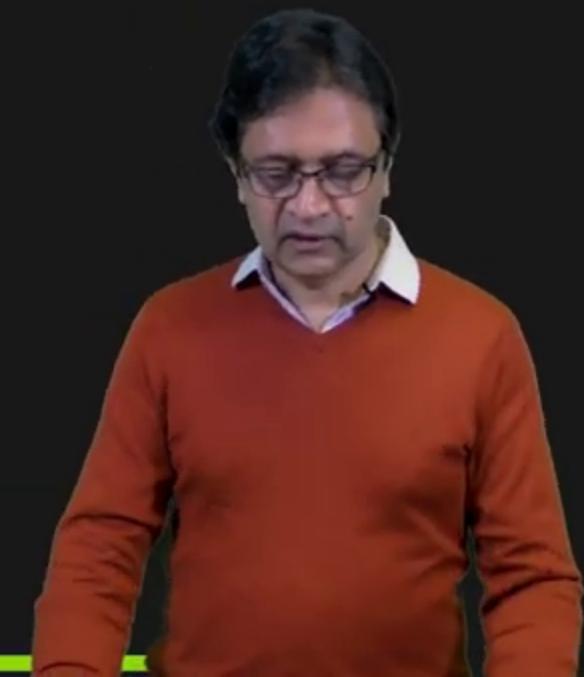


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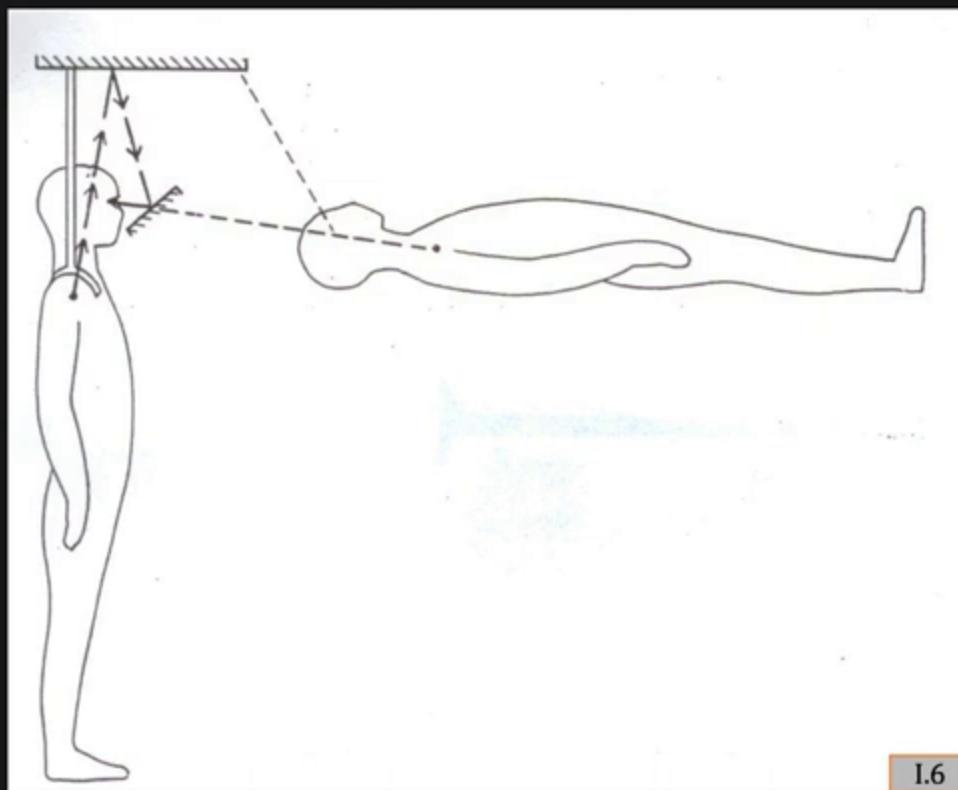


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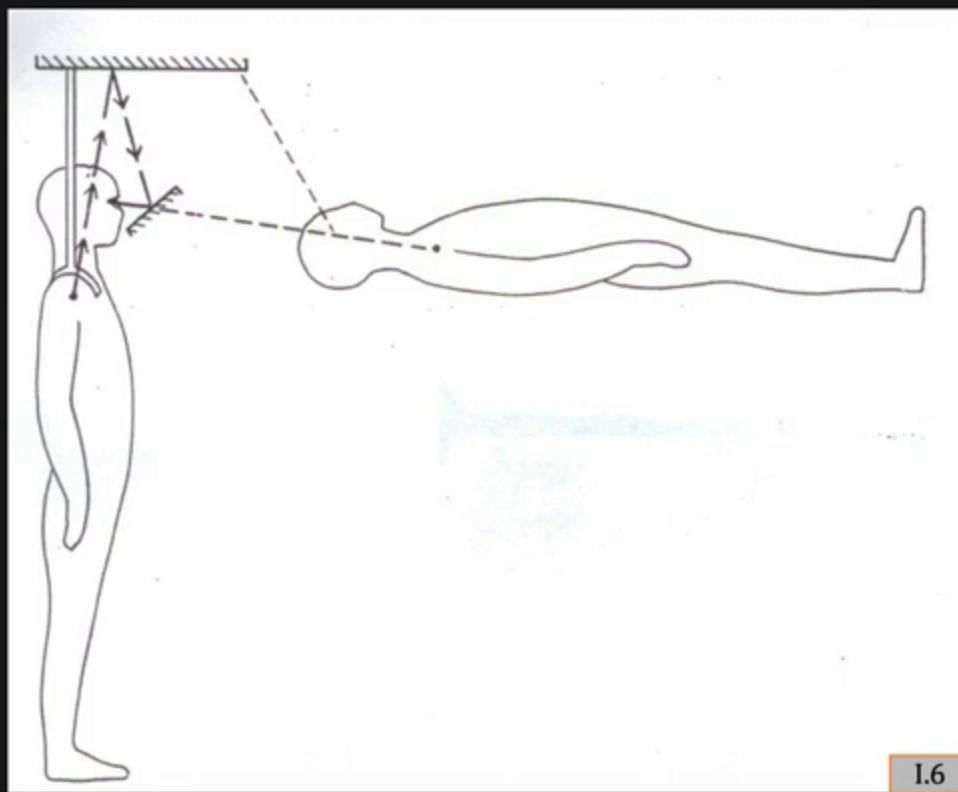


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Pfister's Hen



Prisms are placed in front of each eye to rotate the field of view, effecting the efficiency of depth perception



[Hess 1953]

Pfister's Hen

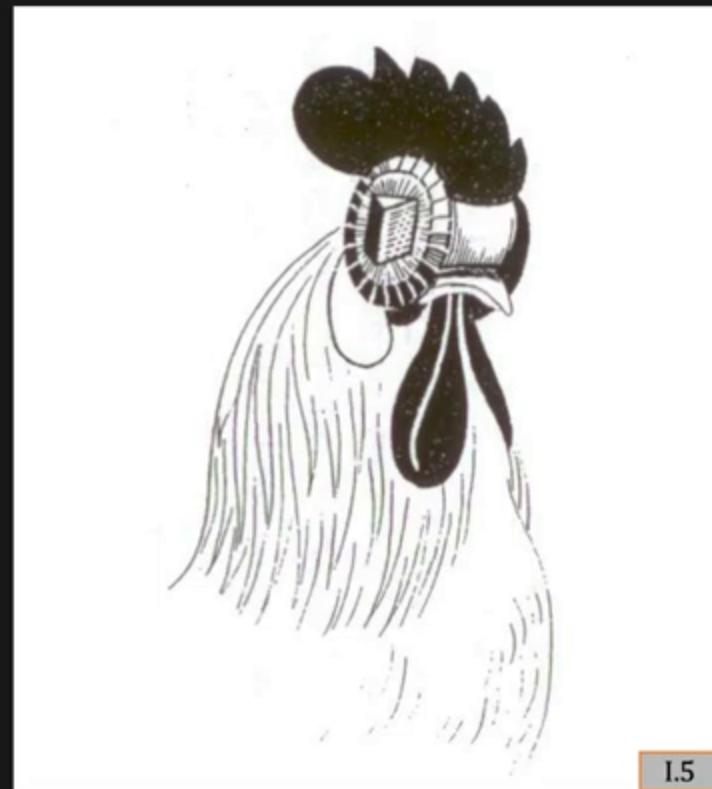


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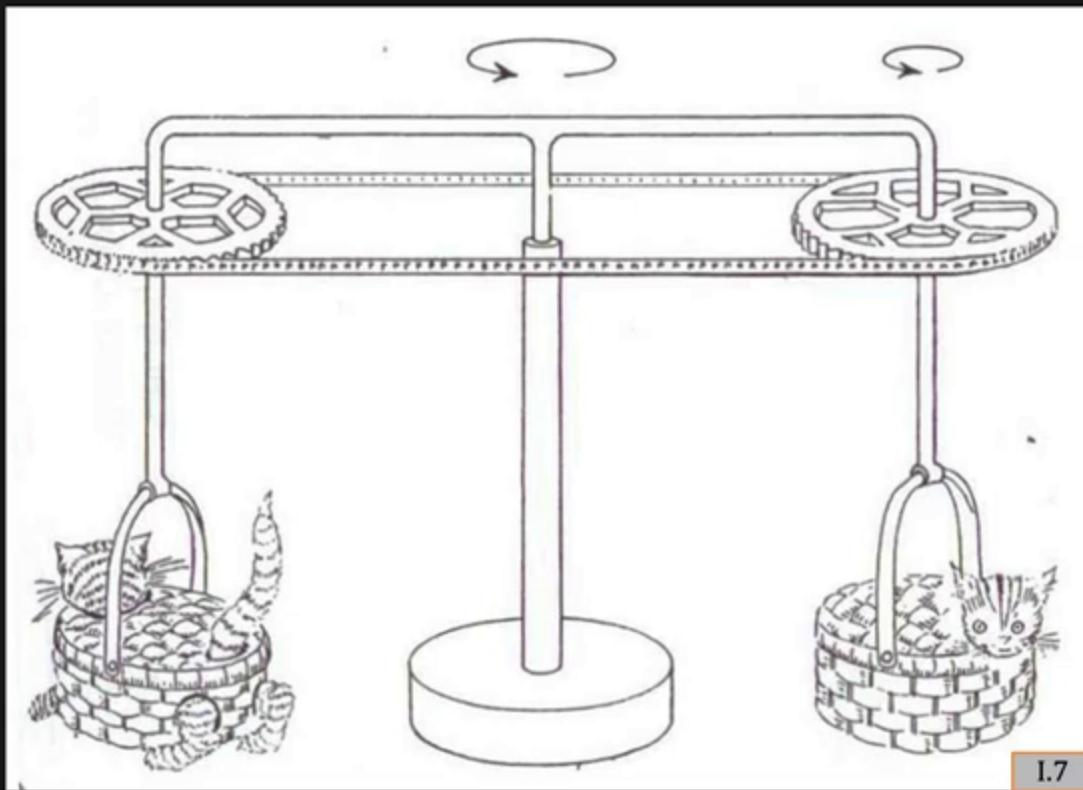


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Percpetual Learning and Vision



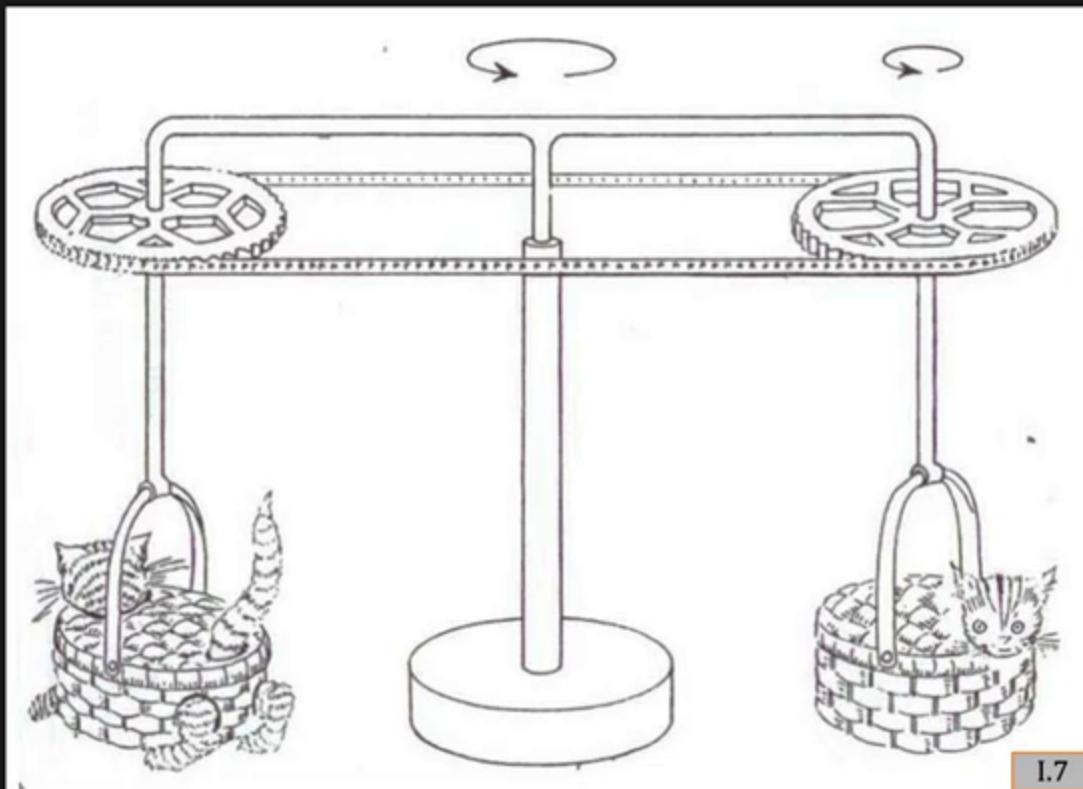
I.7

Apparatus designed by Held and Hein to discover whether learning takes place in a passive animal.

[Held 1963]

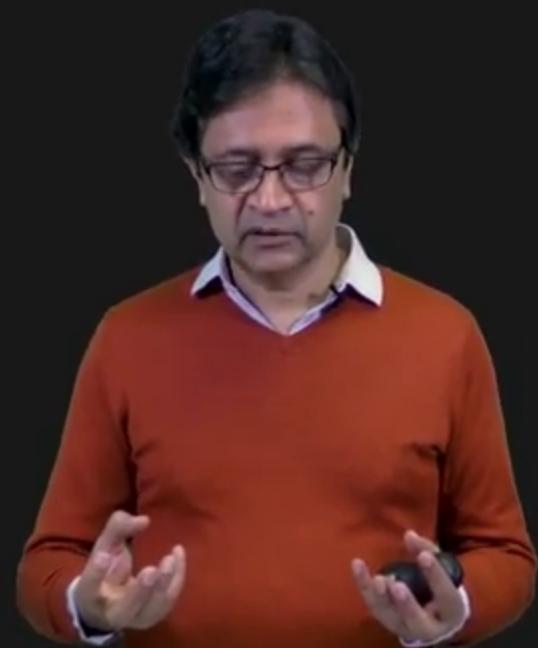


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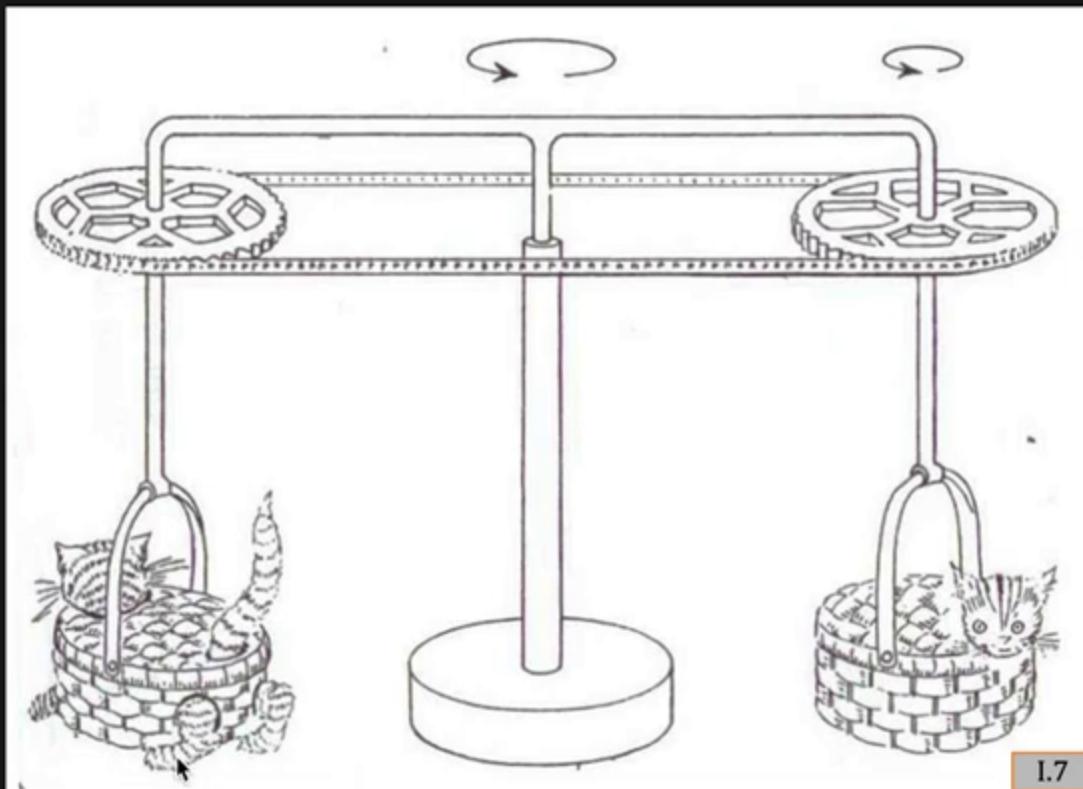


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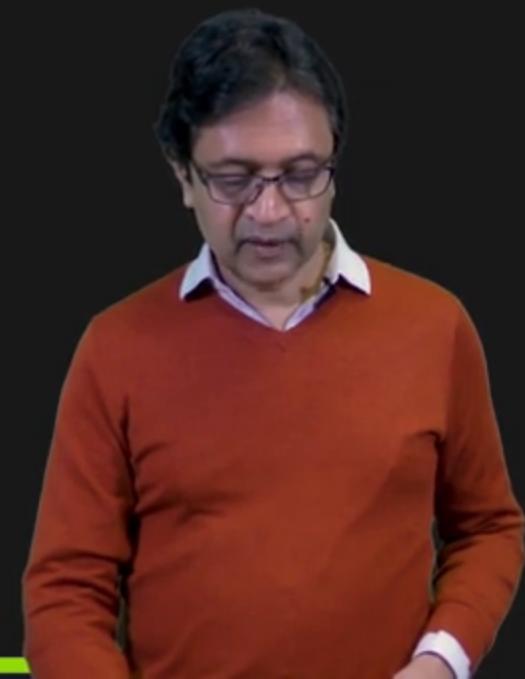
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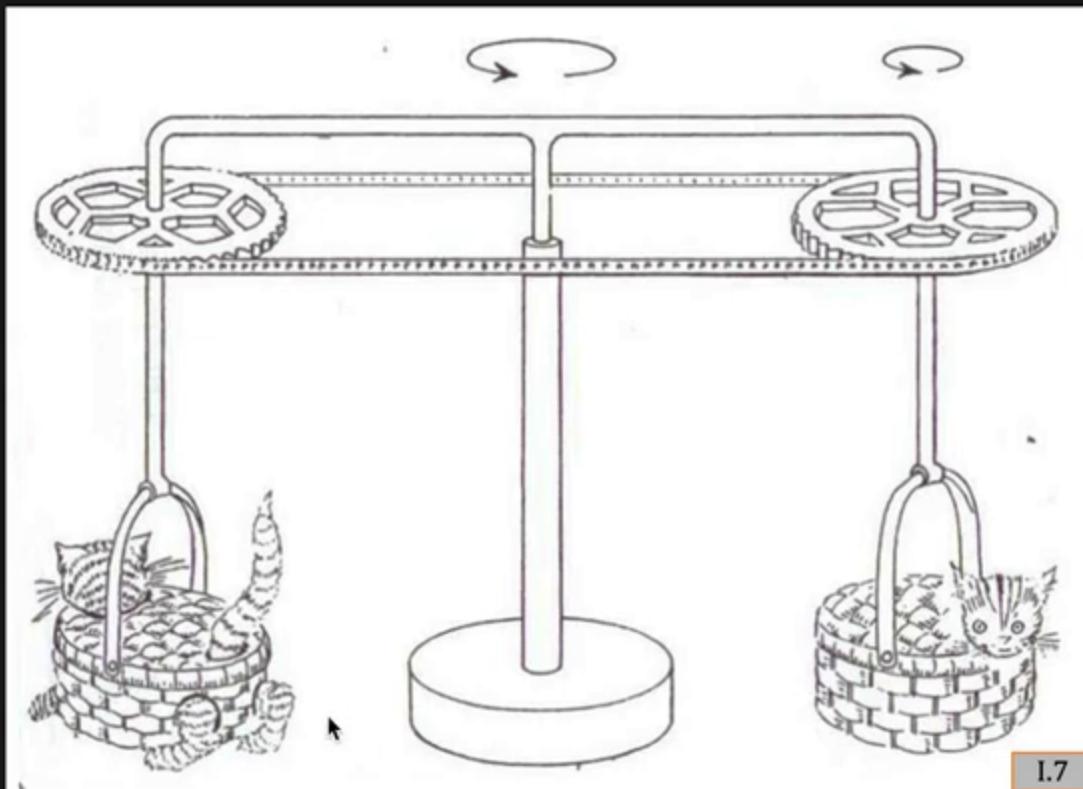
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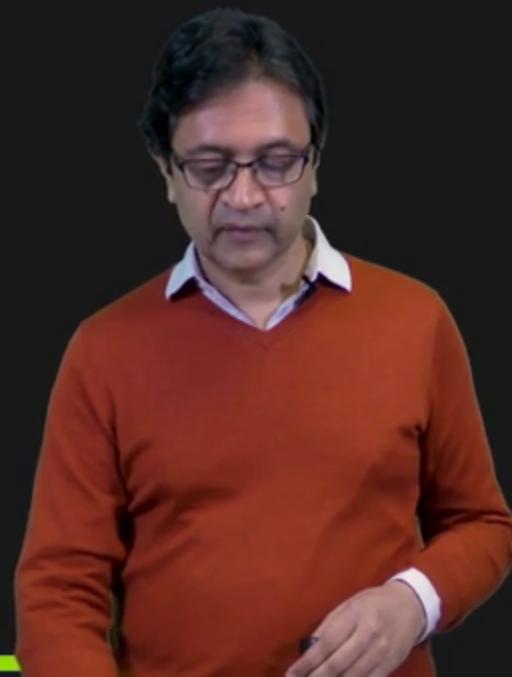
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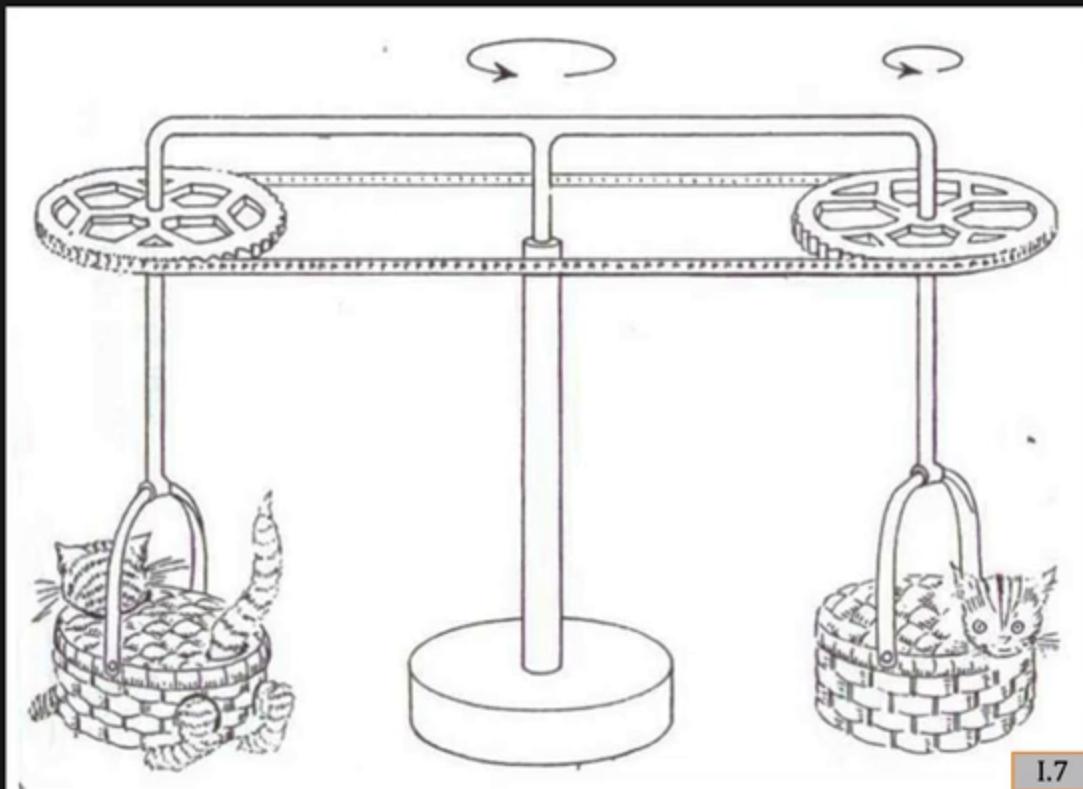
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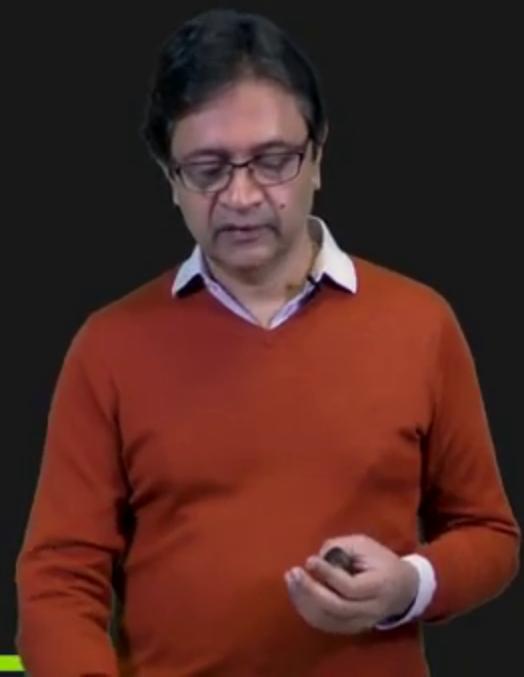
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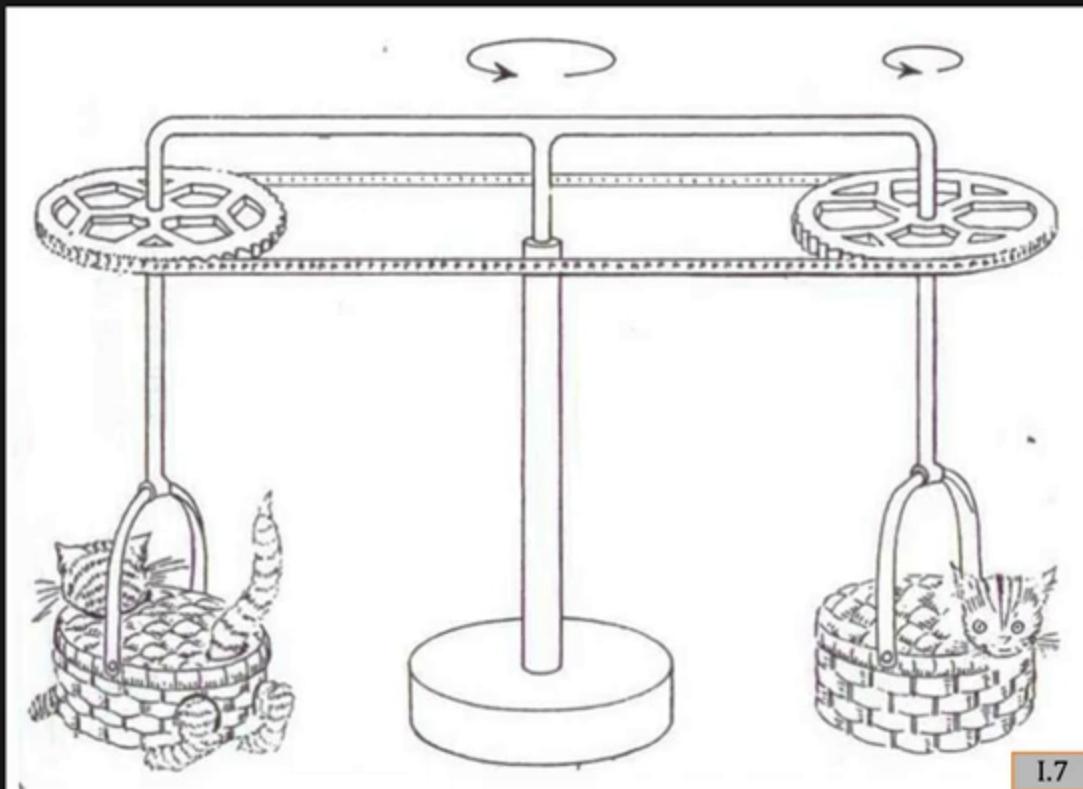
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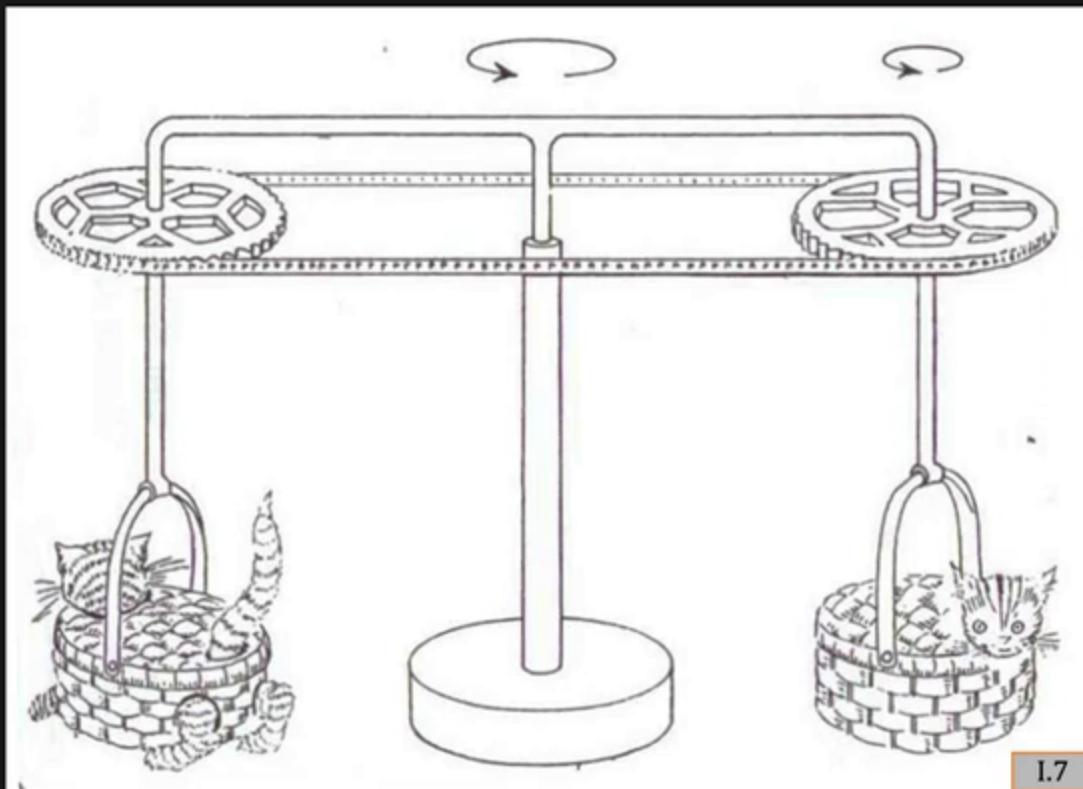


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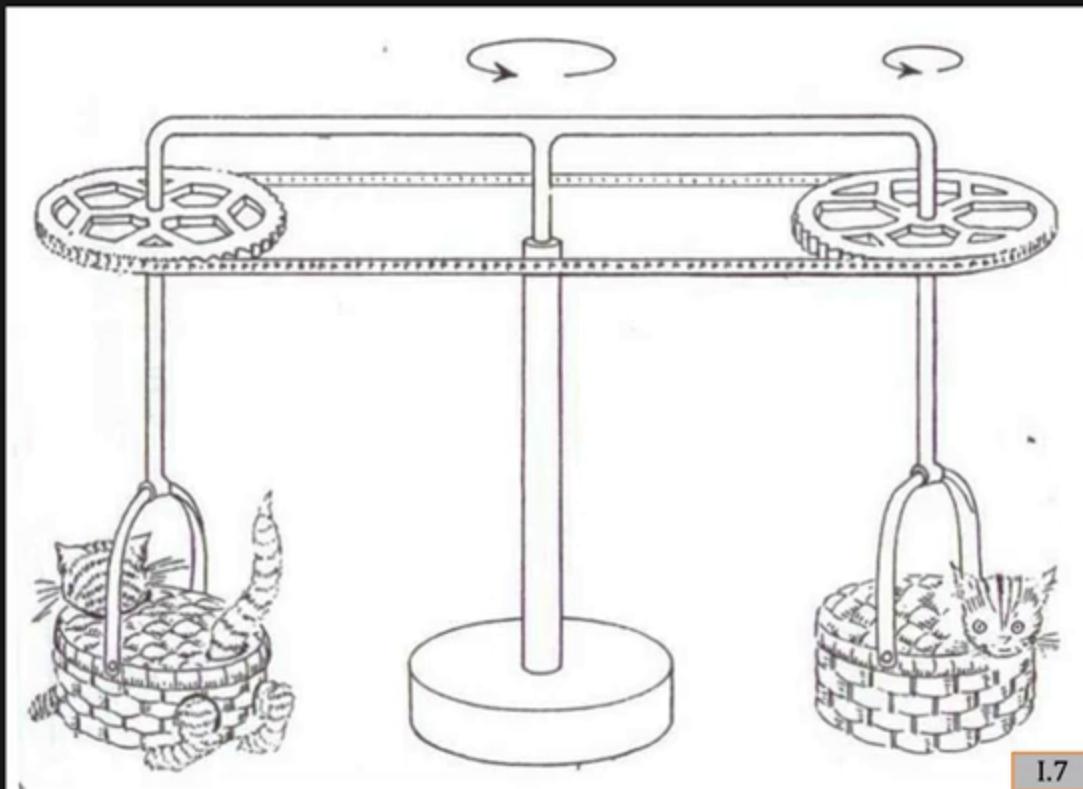


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References and Credits

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Columbia University

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