

Network Client:

# The Ins And Outs of Strabismus

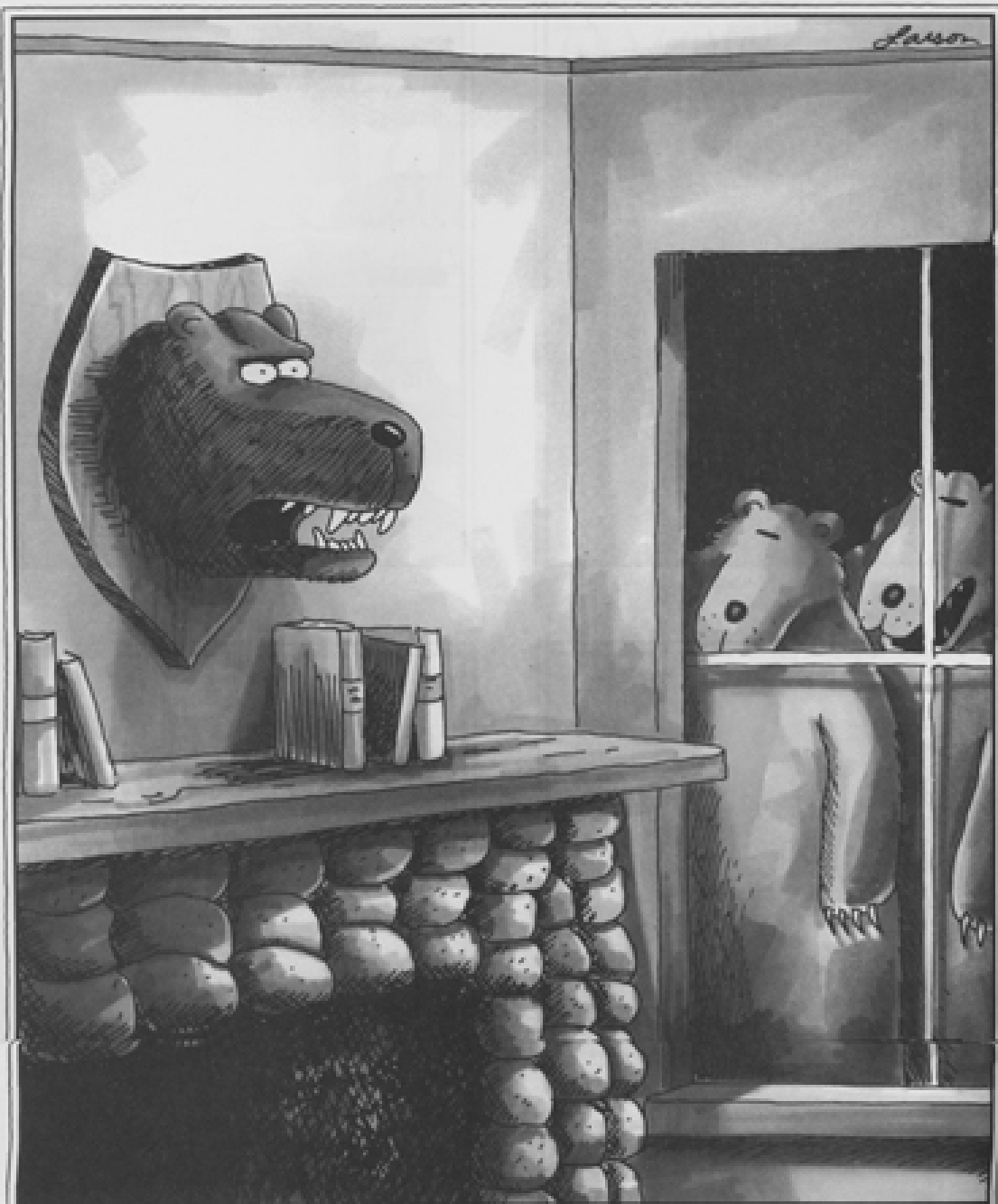
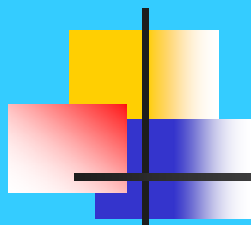


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Sue Crowe COT

The Cole Eye Institute

Cleveland Clinic Foundation



"It's Vince, all right. It's his nose, his mouth, his fur ... but his eyes—there's something not quite right about his eyes."



# Definition of Strabismus

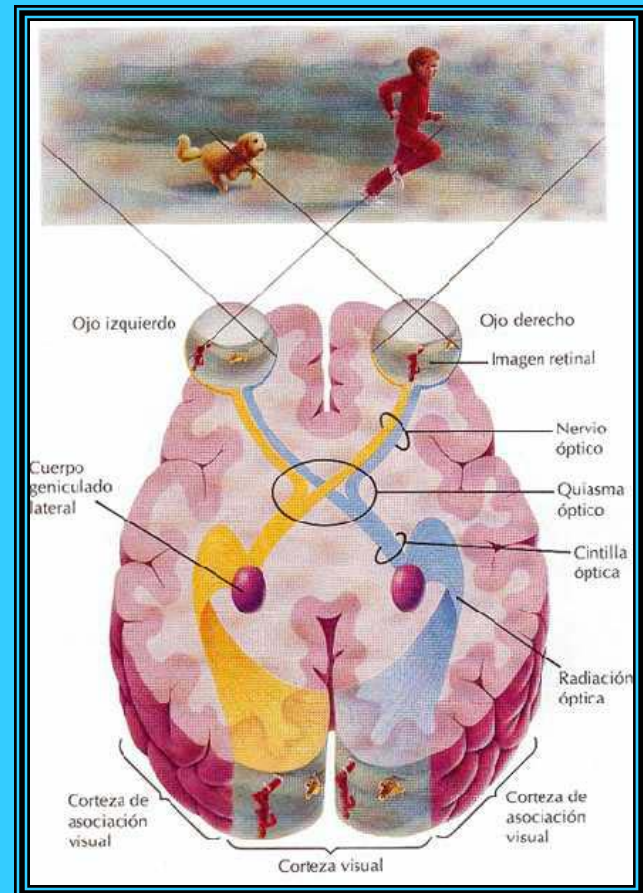
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- Any ocular misalignment or tendency toward misalignment



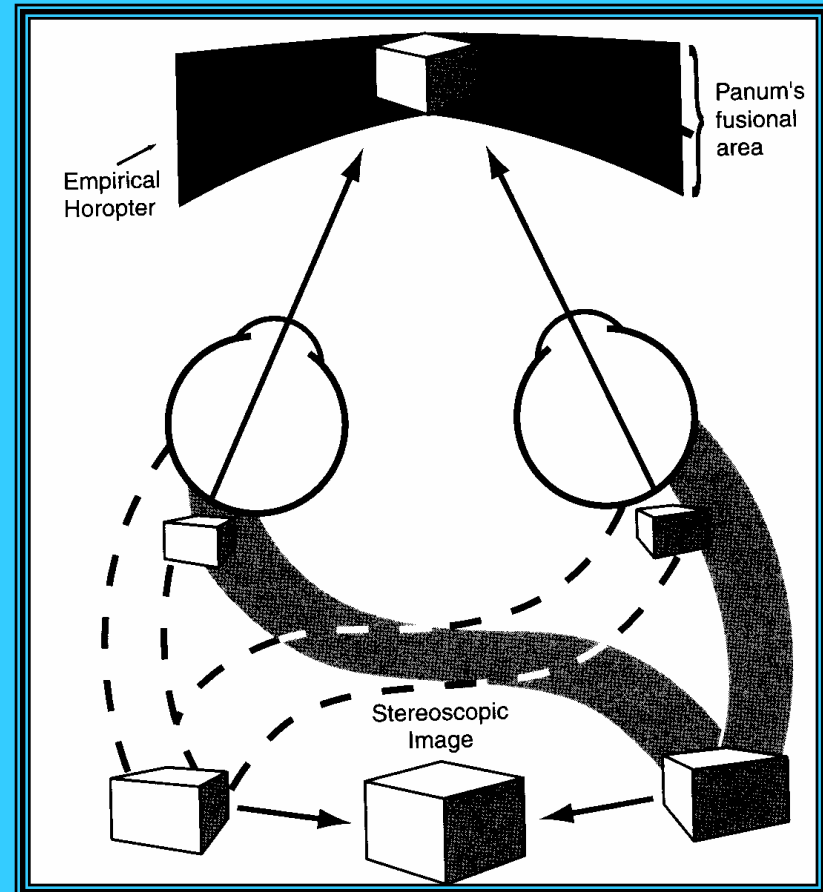
# Binocular Vision

- Requirements
  - Retinal images
    - Corresponding areas
      - fovea
    - Similar in
      - Size
      - Shape
      - clarity

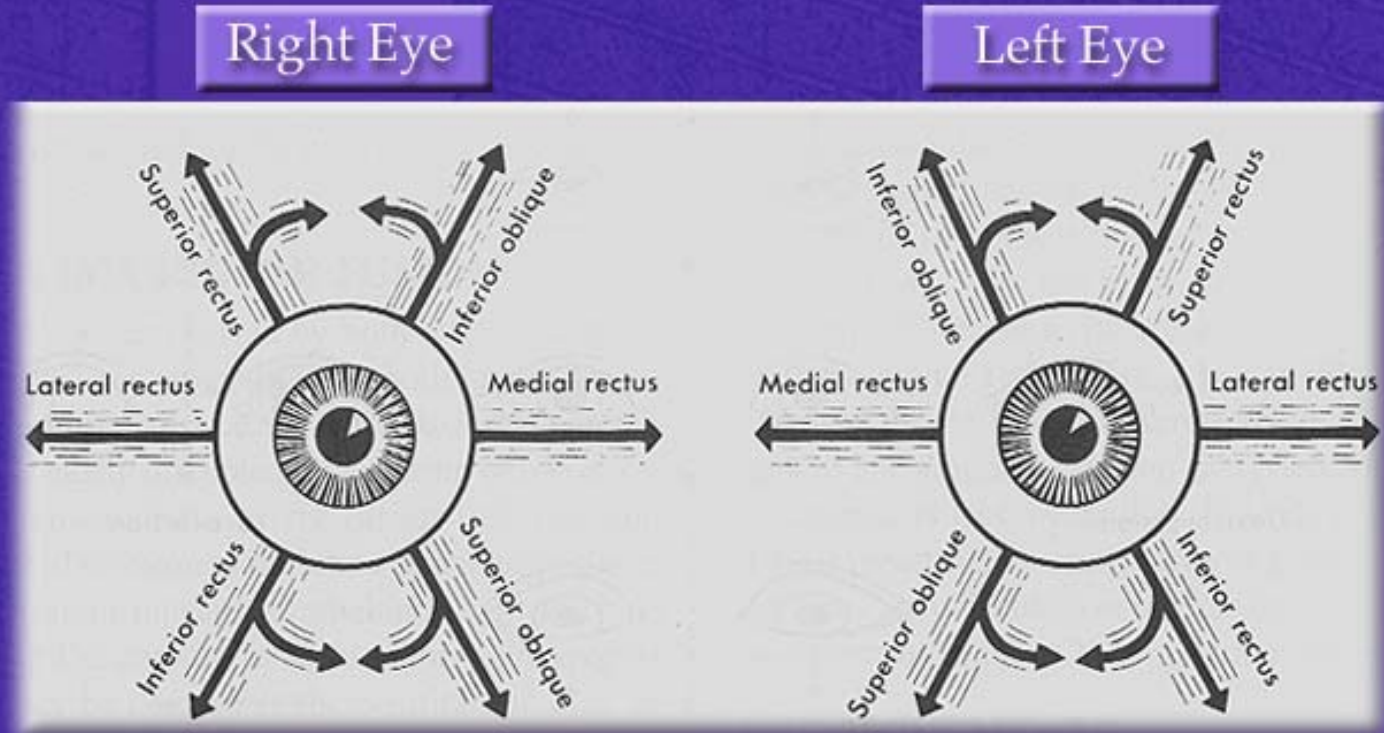


# Motor Fusion

- Requirements
  - Binocular vision
  - Eye muscle control
- Results
  - Stereopsis
    - Depth perception
- Sensory reflex
  - Automatic
    - Age 6 months
    - Fine degrees
  - Requirements present later
    - Age 2
    - Peripheral fusion



# Extraocular Muscles

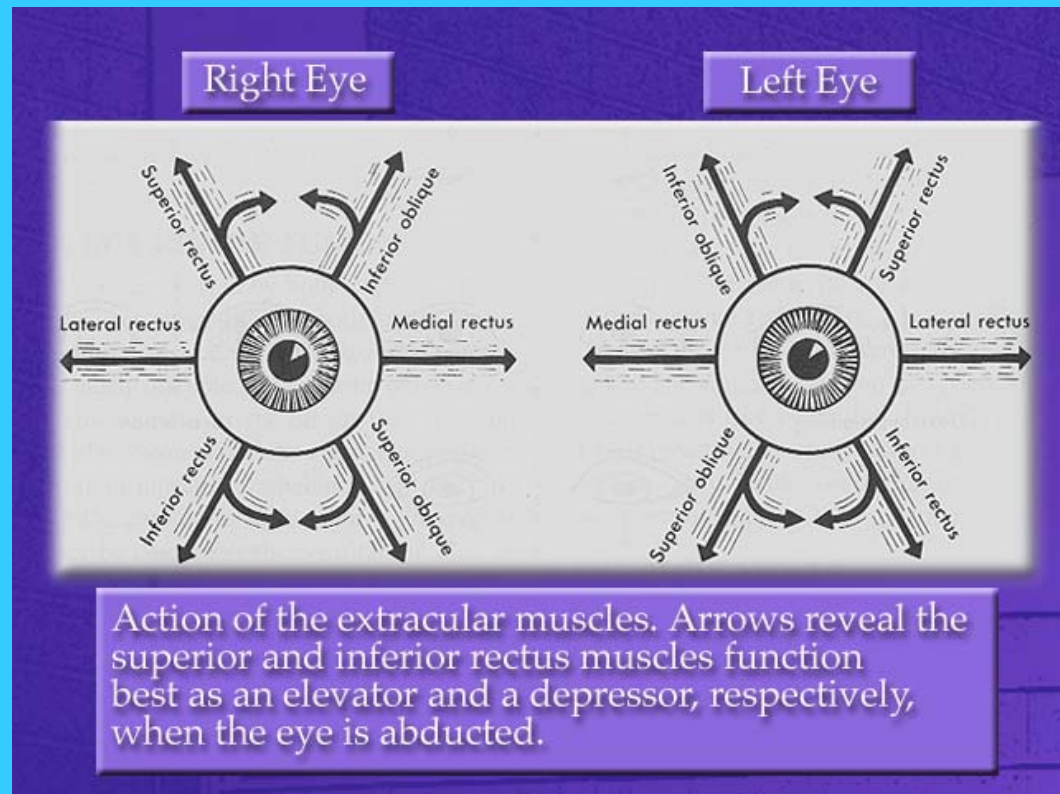


Action of the extracular muscles. Arrows reveal the superior and inferior rectus muscles function best as an elevator and a depressor, respectively, when the eye is abducted.



# Muscle Cooperation

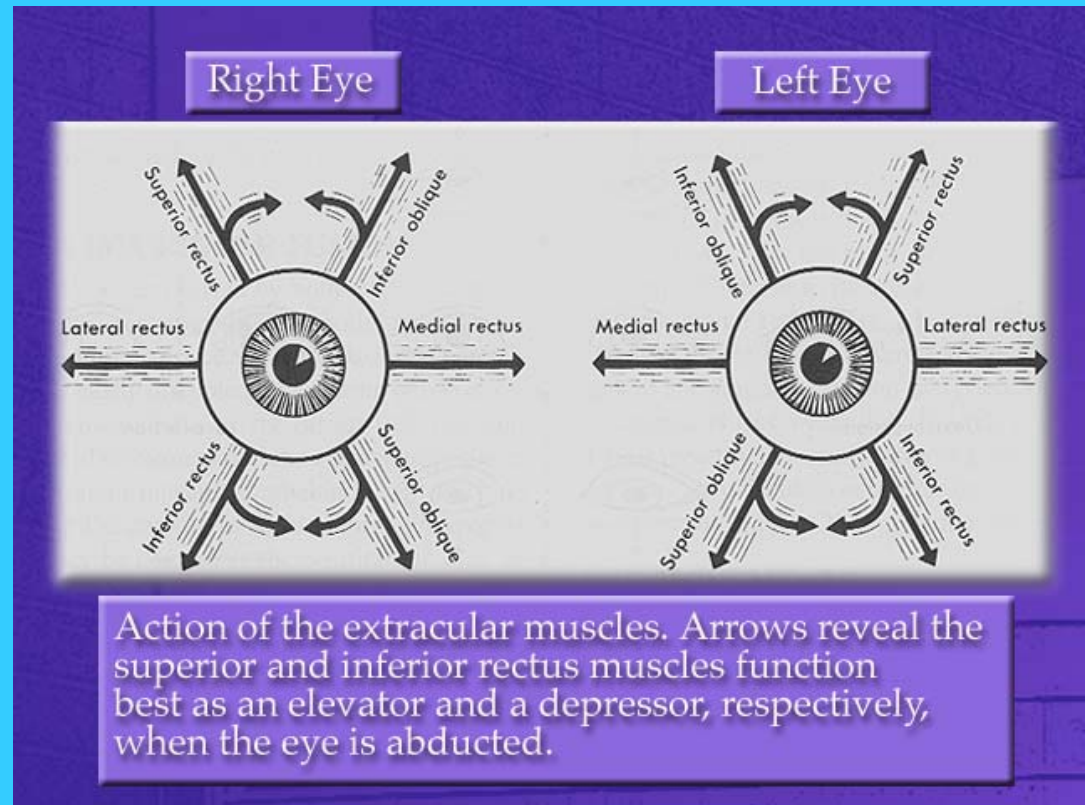
- Ductions
  - Sherrington's Law of Reciprocal Innervation
    - Agonist
    - Antagonist



# Muscle Cooperation

## ■ Versions

- Hering's Law of Motor Correspondance
  - Yoke muscles
    - Paired agonists
    - Paired antagonists







# Strabismus

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- Prevalence
  - 4% Children
  - 1% Adults
- Consequences
  - Amblyopia
  - Diplopia
  - Social stigma





# The Strabismus Exam

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- Role of technician
  - Obtain a detailed history.
  - Test binocular status
  - Establish the best corrected vision.
  - Determine the type of deviation.
  - Measure the deviation.



# History Taking

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- Children
  - Age of onset
  - Direction of the deviation
  - Constant or intermittent
  - One eye deviates or alternate fixation
  - Any precipitating event prior to onset
  - Treatment so far if any
    - Patching, glasses, surgery
  - Family history of strabismus



# History Taking

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- Adult

- Diplopia

- Onset
- Better or worse in different gazes
- Precipitating event

- No diplopia

- History of childhood strabismus
  - Ask same questions as for child

# Method of Examination

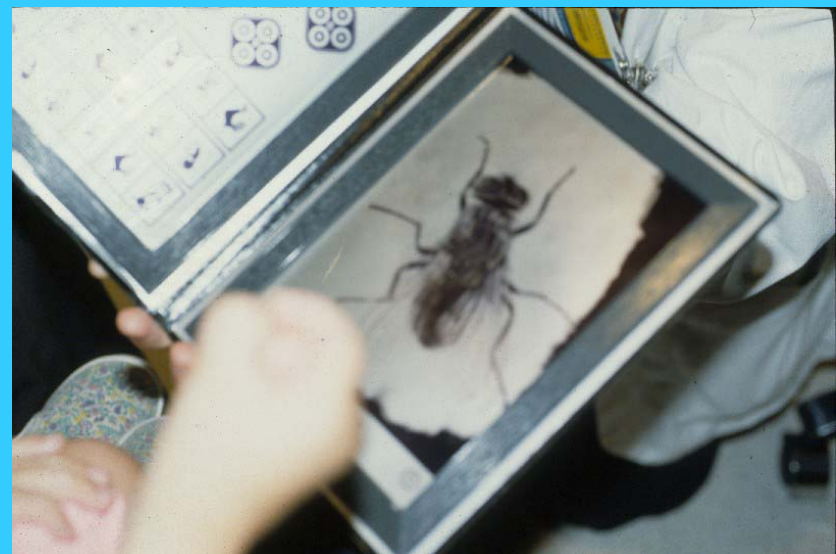


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- Observation
  - Obvious deviation?
  - Constant or intermittent?
  - Abnormal head posture?
- Assess binocularity
- Assess visual acuity

# Stereopsis

- Ability to see depth
  - Amount of horizontal separation of the two images is measured as an angle in seconds of arc
  - Dependent on visual acuity, monocular clues, and interpupillary distance
    - Eyes further apart=greater stereo potential
      - 30 seconds minimum
    - Monocular clues
      - Motion, shadows, relative size





# Tests of Binocularity

- Titmus
- Randot
- Worth 4 Dot
- Bagolini lenses
- Red glass test



# Titmus Stereo Test

- Disparity ranges
  - 3000 to 40 sec.
  - Bifoveal
    - 40-60 sec.
  - Peripheral
    - 80-3000 sec.
- Tips on use
  - Disadvantages
    - Monocular clues





# Acuity and Stereopsis

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- $20/25 = 40 \text{ sec.}$

- $20/30 = 50 \text{ sec.}$

- $20/40 = 60 \text{ sec.}$

- $20/50 = 80 \text{ sec.}$

- $20/60 = 100 \text{ sec.}$

- $20/70 = 140 \text{ sec.}$

- $20/80 = 200 \text{ sec.}$

- $20/100 = 400 \text{ sec.}$

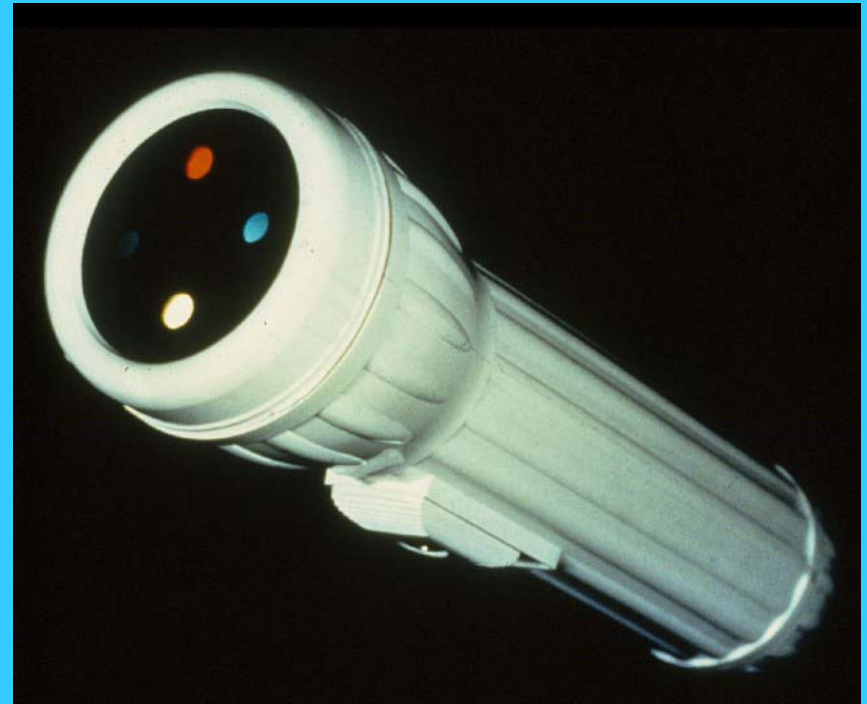
- $20/200 = 800 \text{ sec.}$



# Worth 4 Dot Test

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- Suppression
- Peripheral fusion





# Strabismus Terminology

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- Ortho
  - Greek=straight
- Phoria
  - Latent tendency
  - Alignment maintained by fusion
  - Common
    - Up to 70%
- Tropia
  - Constant and observable
    - Adults
      - Diplopia possible
    - Children
      - Amblyopia
  - Surgery indicated
    - Adults
      - Restore fusion
    - Children
      - Enable binocularity to develop

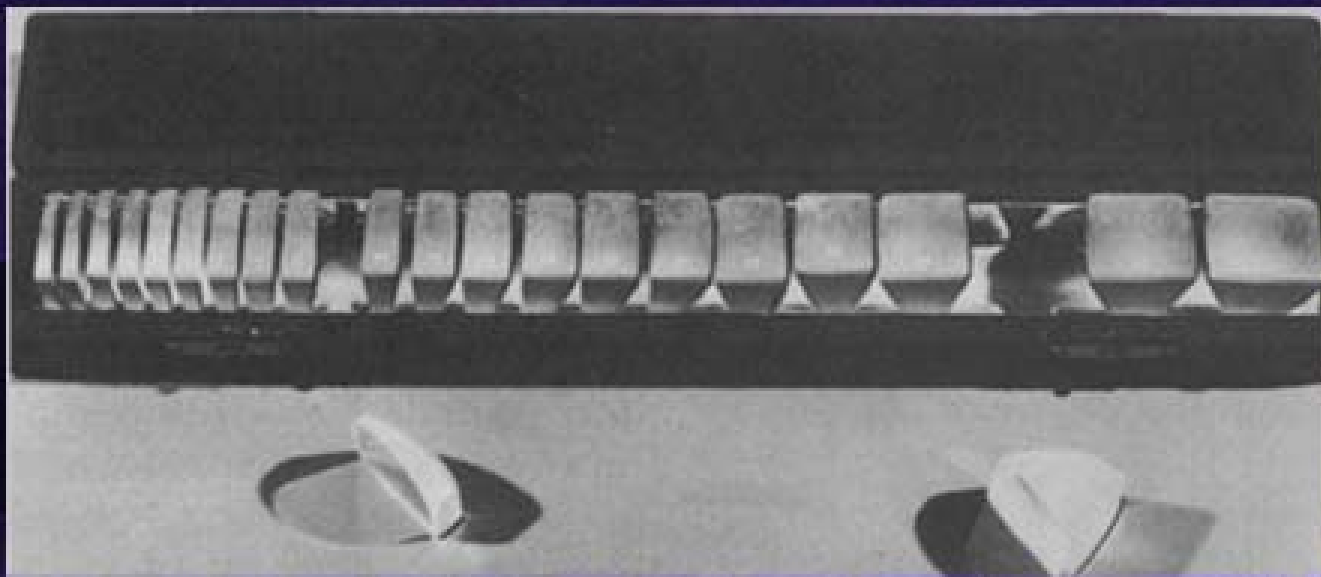


# Types of Strabismus

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- Esotropia
- Exotropia
- Hyper deviations
- Mixed deviations
- Comitant
- Incomitant
- Restrictive
- Non-restrictive
- Constant
- Intermittent



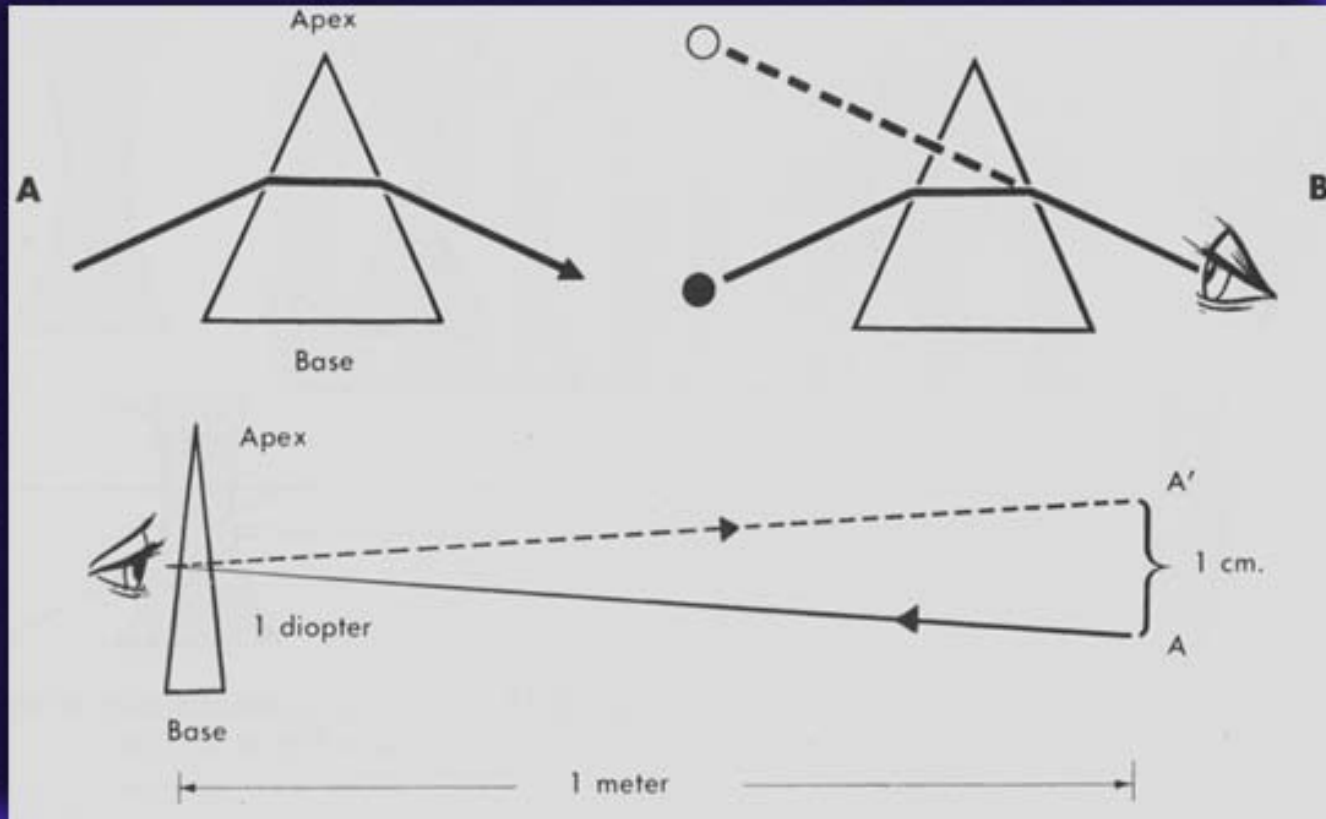


Loose, or individual, prisms set.

Prism bars used  
to measure  
the amplitude or  
power of fusion



# Prism Diopters





# Evaluating Strabismus

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Type

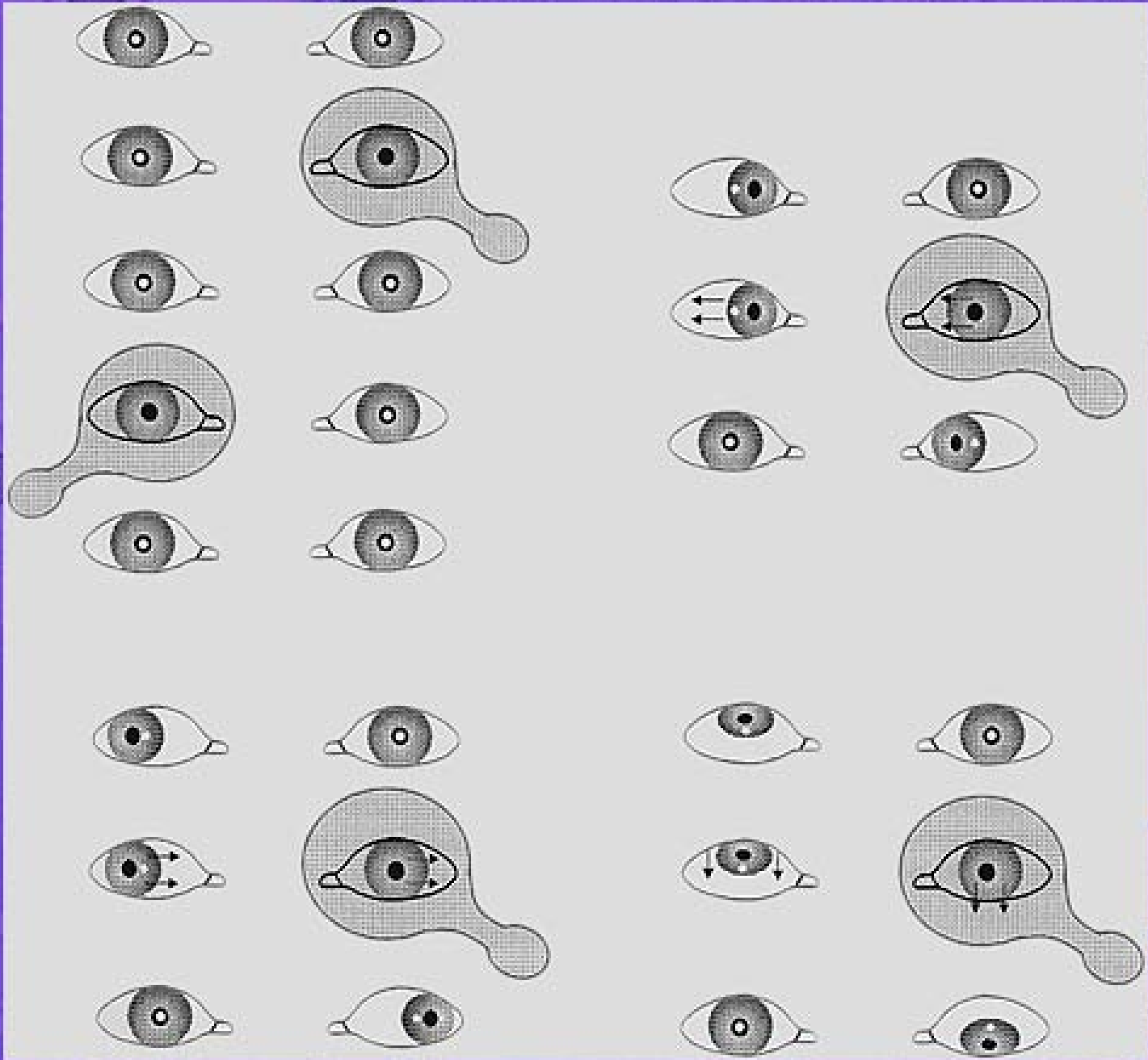
Phoria or Tropia

Cover uncover

Amount

Alternate cover





# Cover Uncover Alternate Cover

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# Helpful Hints

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- Observation

- Phoria?
- Tropia?
- Constant?
- Intermittent?

- Measurements

- Phoria
  - Quick cover uncover
- Tropia
  - Glasses\*
  - Accomodative target
  - Keep patient focused
    - Prism bar is faster
  - Hyper deviations
    - All 9 gaze positions
  - Mixed deviations
    - Start with largest deviation
    - Stack loose prisms





# Abbreviations

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- Distance

- Eso deviations
  - E
  - ET
- Exo deviations
  - X
  - XT
  - X(T)
- Hyper deviations
  - HT
  - H<sub>0</sub>T

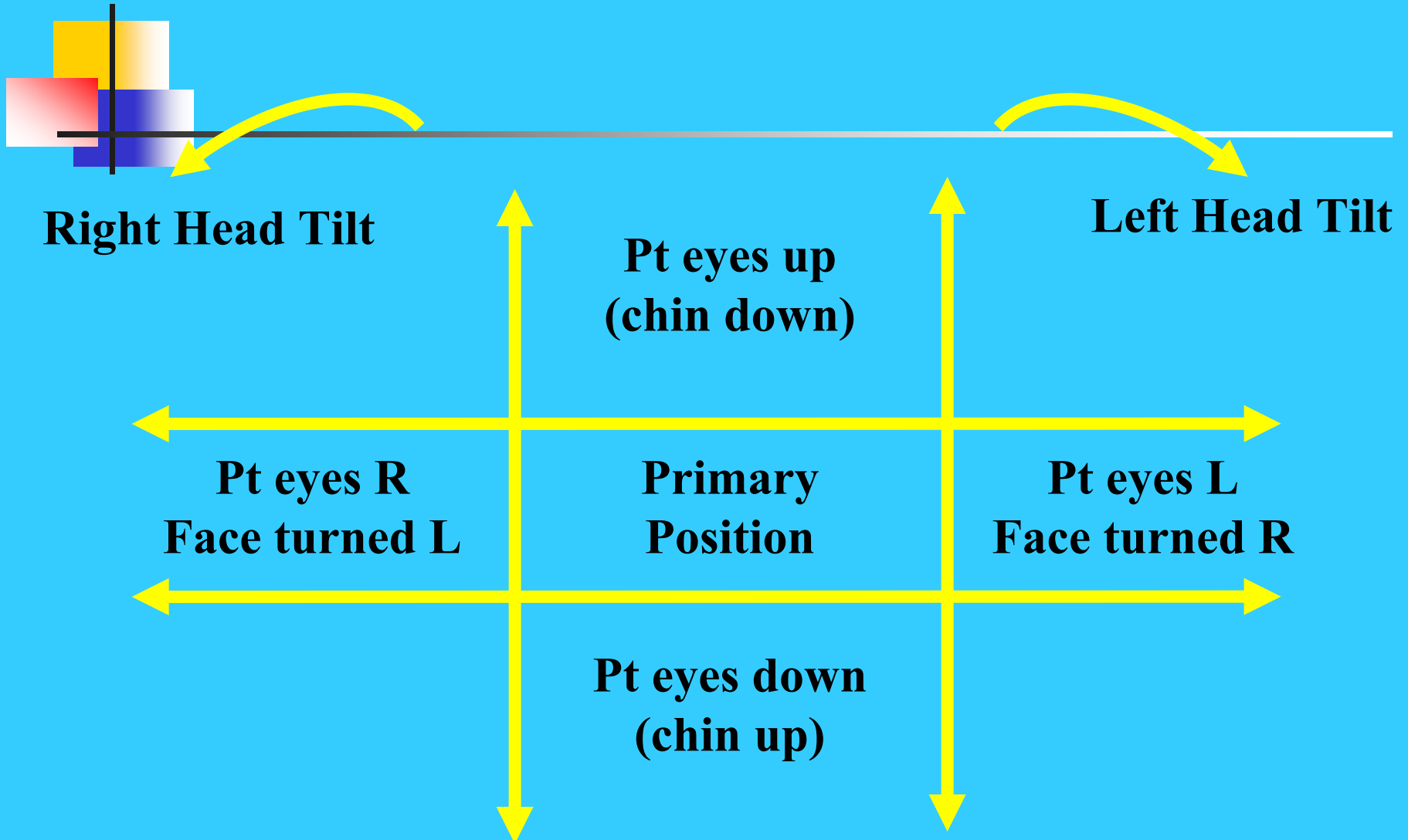
- Near

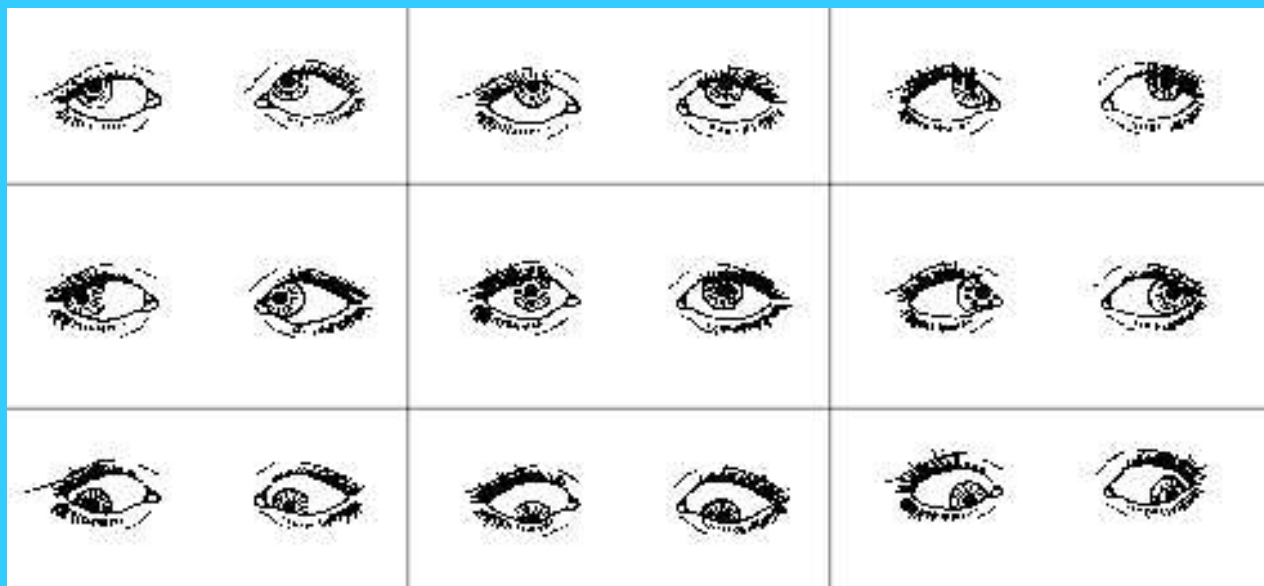
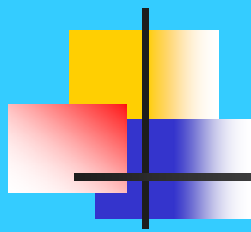
- ET`

- Examples

- RXT cc 25
- Alt ET sc 30
- X(T) sc builds to 20
- LET` cc 35
- LHT sc 10
- RET cc 15
- RHT cc 25

# Cardinal Positions







# Incomitant Strabismus

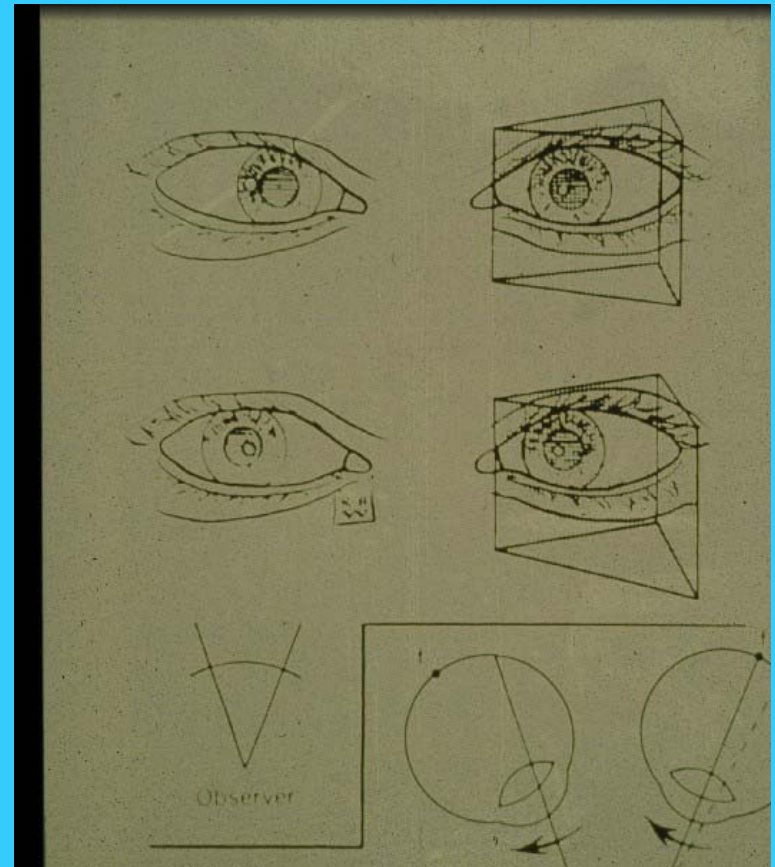
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- Versions
  - A and V patterns
  - Overactions
  - Restrictions



# Hirshberg and Krimsky

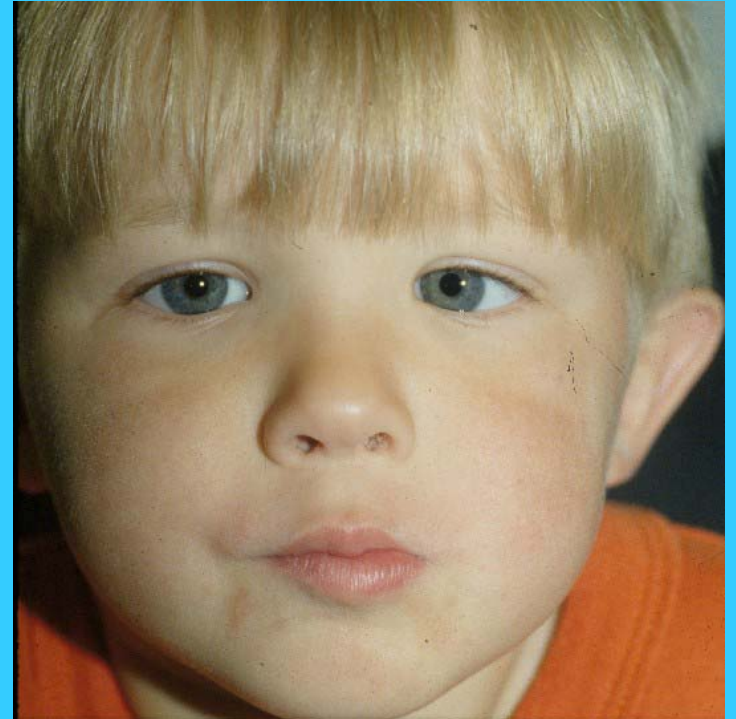
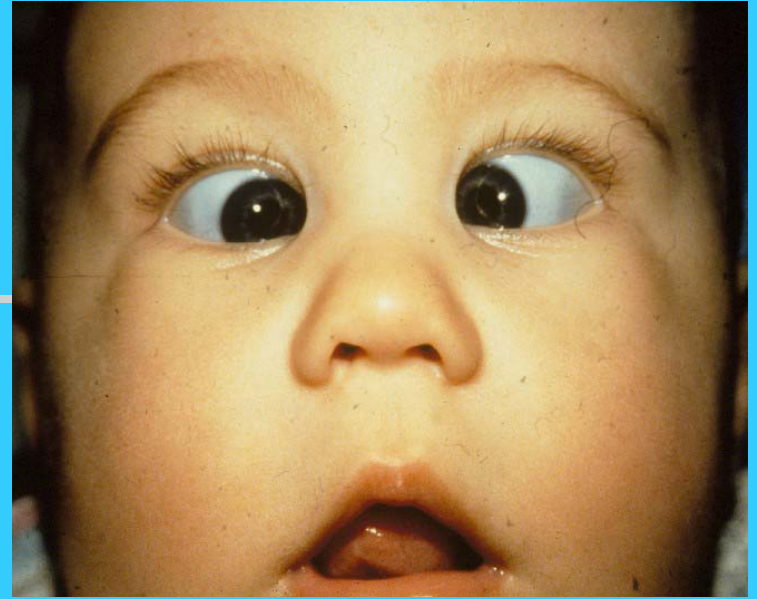
- Indications
  - Vision  $<20/400$
- Method
  - Corneal reflex observation
    - Hirshberg
      - Direction of deviation
    - Krimsky
      - Amount
        - 1 mm = 7 prism diopters





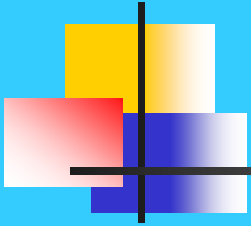
# Esotropia

- Inward deviation
- Types
  - Congenital
  - Accomodative
  - Acquired non-accomodative
  - Pseudostrabismus



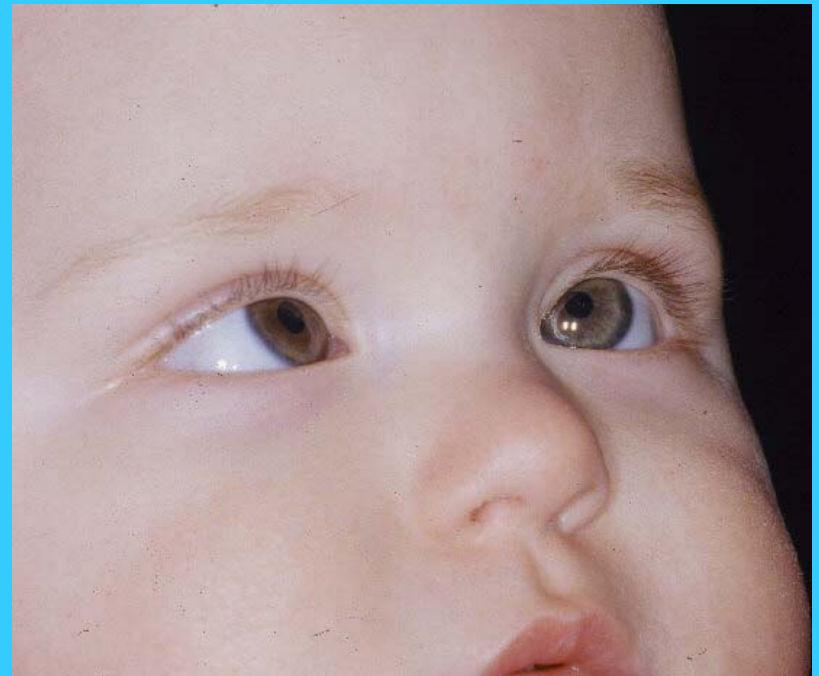


# Alternating Esotropia



# Congenital Esotropia

- Features
  - Onset <6 months
  - Large angle
    - 30-70 prism diopters
  - Cross-fixation
  - Amblyopia
    - 40-50%
- Treatment
  - Surgery
    - Timing controversial
- Etiology
  - Unknown





# Accommodative Esotropia

- Features
  - Onset age 2-3
  - Begins intermittently
  - Variable angle
- Treatment
  - Glasses
- Etiology
  - Overconvergence secondary to high hypermetropia



# Accommodative Esotropia Glasses

- Fully correct
- Partially correct
  - Distance = near
    - Amblyopia
    - Surgery
  - Distance < near
    - High AC/A ratio
    - bifocals



# Acquired Non-Accommodative Esotropia

- Features
  - Age 1-5
  - No hypermetropia
- Causes
  - Neurological
- Treatment
  - Surgery





# Pseudostrabismus

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- Features
  - Appearance of ET
- Cause
  - Wide epicanthal folds
    - Racial differences
- Treatment
  - Growth





# Exotropia

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- Outward deviation
- Types
  - Congenital
  - Intermittent
  - Convergence insufficiency
  - Sensory





# Congenital Exotropia

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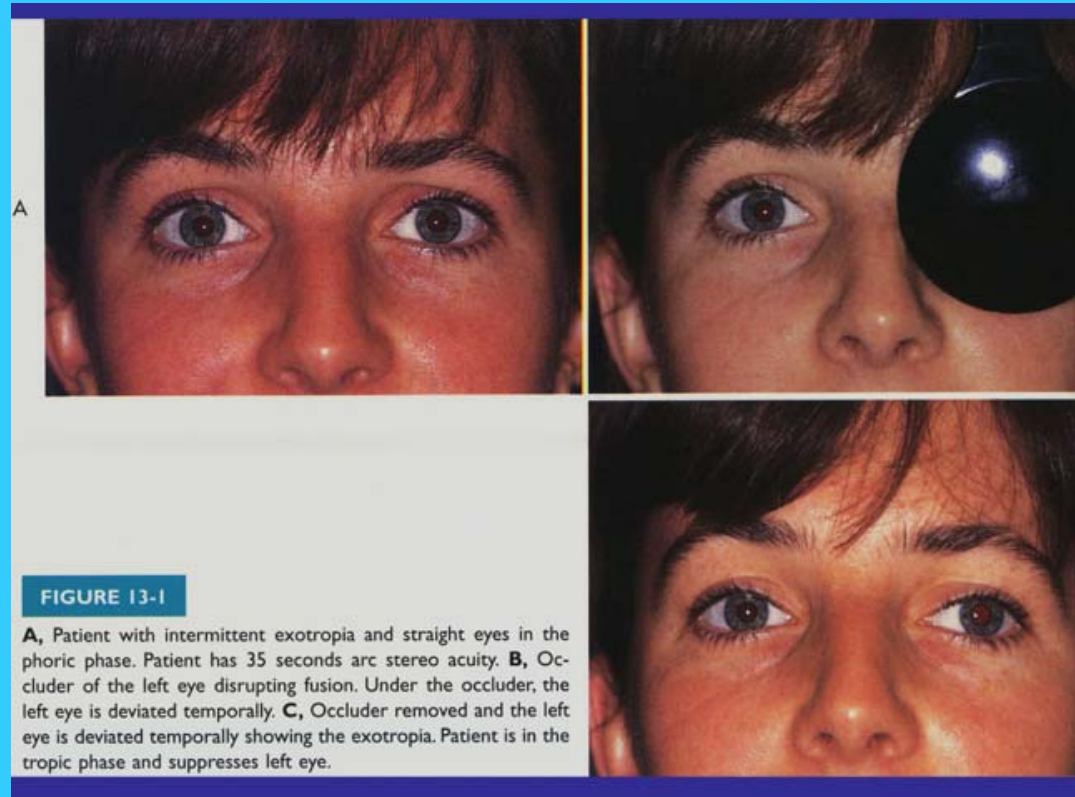
- Extremely rare.
- Treatment is surgery





# Intermittent Exotropia

- Features
- Treatment
  - Non surgical
  - Surgical



# Intermittent Exotropia

- History
- Severity





# Convergence Insufficiency

- Features
  - Remote NPC
    - 10-30cm
    - 5-10cm
  - Reduced convergence amplitudes
    - <20 prism diopters
    - 30-35
- Symptoms
  - Asthenopia
  - Blur/diplopia at near
- Treatment
  - Orthoptic exercises





# Sensory Strabismus

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- Features
  - ET or XT
  - Hard to measure
    - Krimsky
- Cause
  - Poor vision
- Treatment
  - Surgery
    - Results unstable



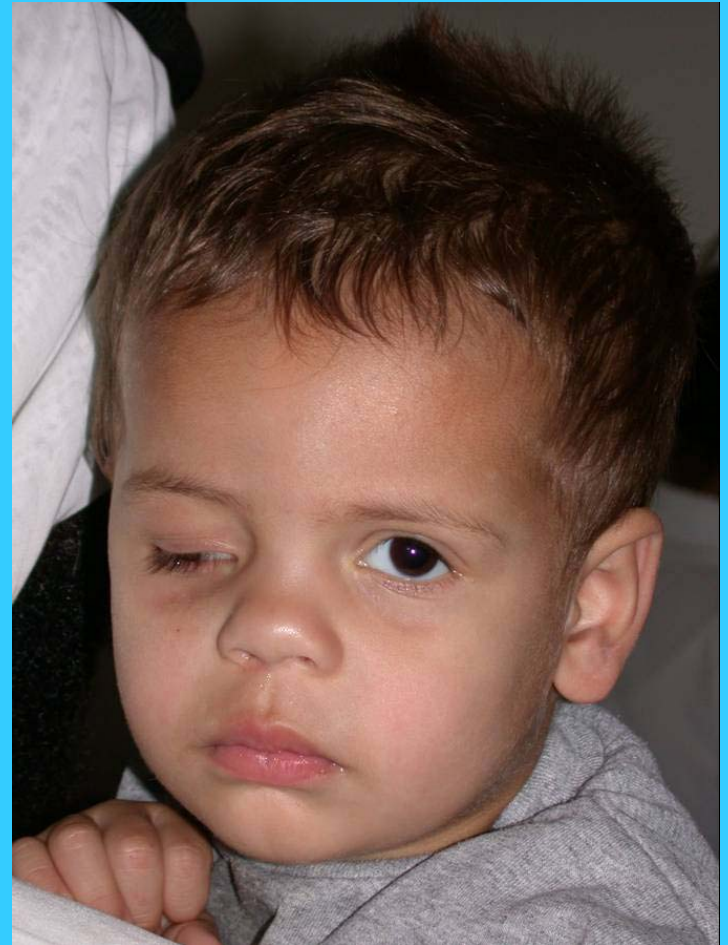
# Vertical Strabismus

- Features
  - Congenital/acquired
  - Incomitant
  - Frequently diagonal
  - Dissociated
- Causes
  - Neurological
    - Cranial nerve palsies
    - Myasthenia gravis
    - Multiple sclerosis
  - Trauma
  - Thyroid eye disease



# Third Nerve Palsy

- Features
  - Congenital/acquired
  - Partial/complete
- Treatment

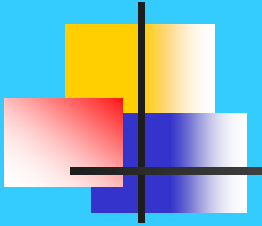


# Fourth Nerve Palsy

- Cause
  - Weak superior oblique
    - Congenital/acquired
- Features
  - Head tilt
- Treatment
  - Surgery









Modigliani and the Portraits of Jeanne Hebuterne



# Sixth Nerve Palsy

- Cause
  - Weak lateral rectus
    - Congenital/acquired
      - Tumors, trauma  
60%
      - Inflammation
- Features
  - Abduction
- Treatment
  - Surgery



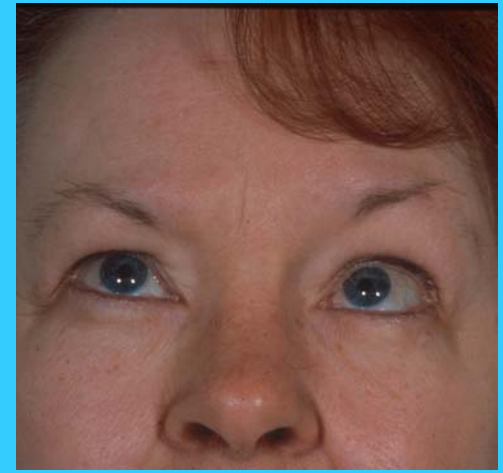




# Thyroid Eye Disease

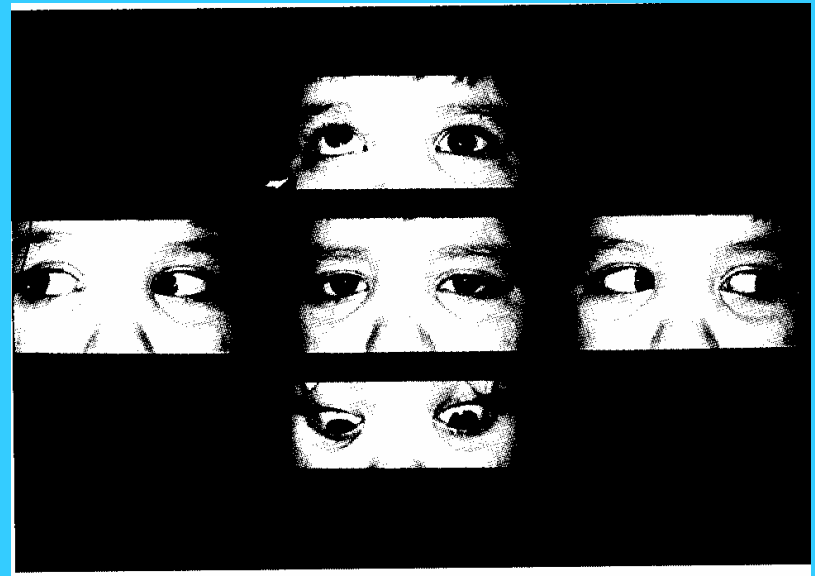
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- Cause
  - Inflammation
- Features
  - Incomitant restrictions
    - Inferior rectus
    - Medial rectus
- Treatment
  - Surgery
    - Timing issues



# Other Causes of Strabismus

- Neurological
  - Myasthenia Gravis
  - Multiple Sclerosis
- Trauma
  - Orbital floor fractures
  - Surgery
    - Cataract
    - Glaucoma
    - Scleral buckle
    - Sinus surgery



# Dissociated Deviations

## Definition

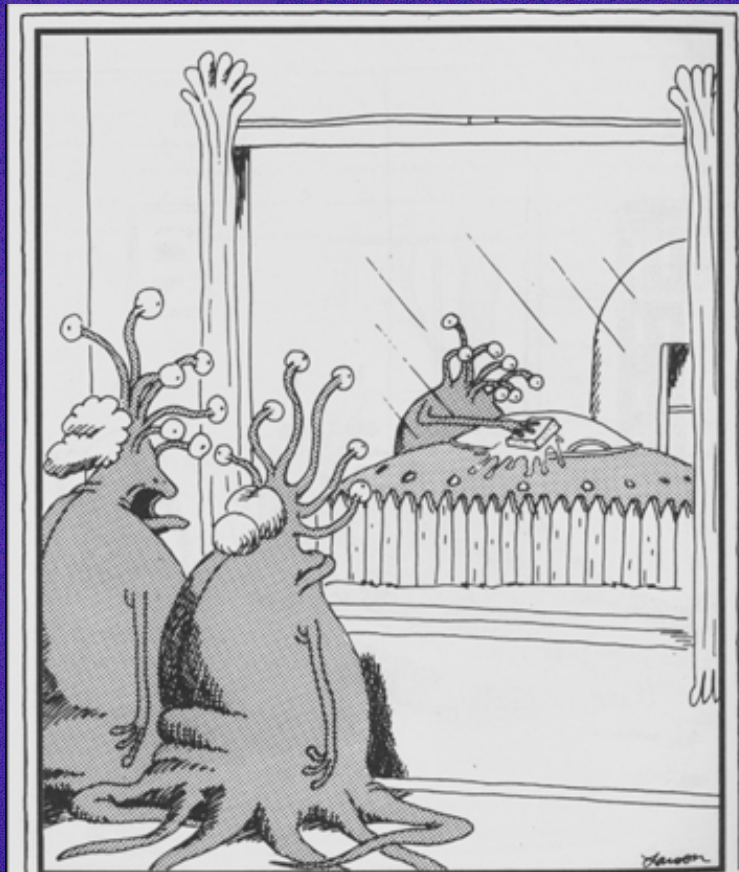
- Herings, Sherringtons laws defied
- Latent nystagmus frequently accompanies
- Occurrence
  - 60-80% for congenital ET patients
  - Most common type of hyper deviation seen in pediatric patients
- Evaluating
  - Presence
  - Which eye
  - Severity
    - Latent or manifest



**Figure 15-14**

Dissociated strabismus complex manifesting mostly DVD right eye and DHD left eye. **A**, Fixating left eye. Right eye is elevated behind cover. **B**, Fixating right eye. Left eye is abducted behind cover. Each eye extorts behind cover

# Conclusion



"The guy creeps me out, Zeena. Sure, he looks like he's just minding his own business—but he always keeps that one eye on my house."