

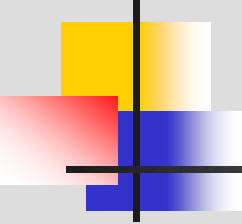
# RETENTION

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J. Mike Razza, BS, DDS, Cert Orthod  
Associate Professor - Orthodontics  
University of Western Australia  
School of Dentistry

Contemporary Orthodontics - Chapter 18  
Level IV Advanced Orthodontics  
Unit B Complex Orthodontics Retention





# RETENTION - Historical Perspective

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1. The Occlusion School
2. The Apical Base School
3. The Mandibular Incisor School
4. The Musculature School

# A Review of the Literature

Richard A. Riedel

- Theorem 1: Teeth which have been moved in or through bone by orthodontic appliances often have a tendency to return to their former positions
- Theorem 2: The elimination of the causes of a malocclusion will prevent recurrence



# A Review of the Literature

## Richard A. Riedel

- Theorem 3: Overcorrection of a malocclusion is a safety factor in retention



# A Review of the Literature

Richard A. Riedel

- Theorem 4: Occlusion is an important factor in retention; therefore, an orthodontist should attempt to produce the best possible occlusion of the teeth

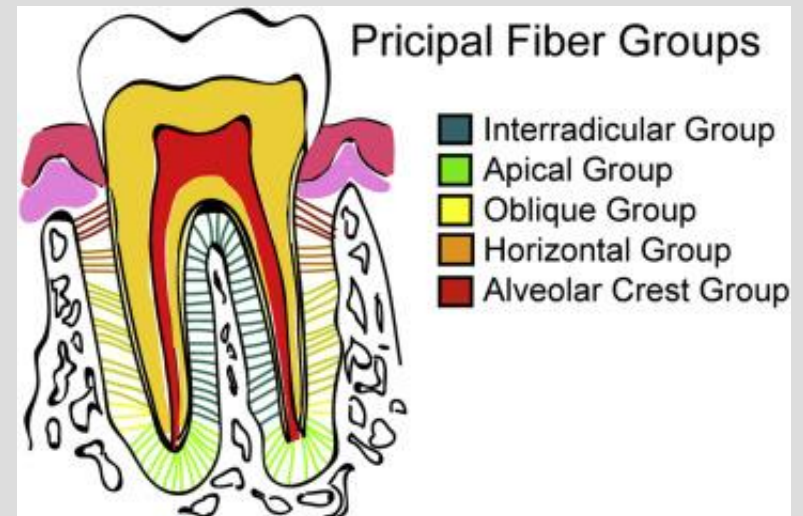
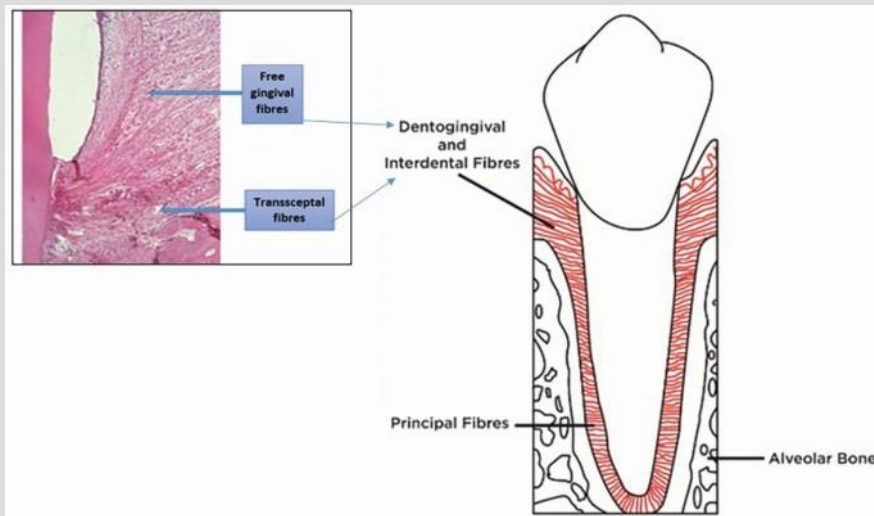


- Theorem 5: Bone and adjacent tissues must be allowed to reorganize around the newly positioned teeth for some length of time

# A Review of the Literature

## Richard A. Riedel

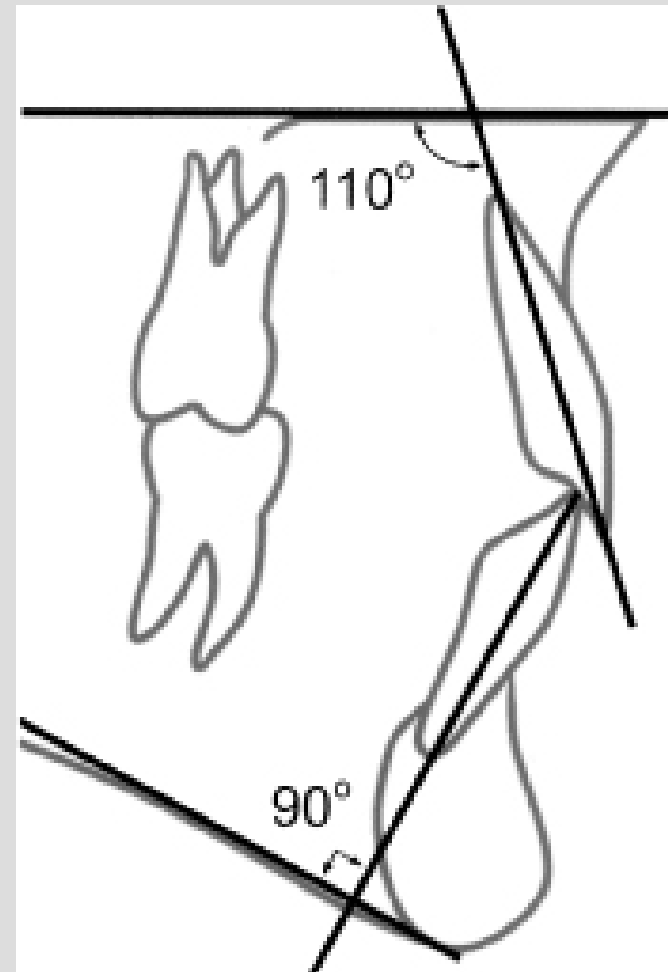
- Theorem 5: Bone and adjacent tissues must be allowed to reorganize around the newly positioned teeth for some length of time



# A Review of the Literature

Richard A. Riedel

- Theorem 6: Placing the lower incisors upright (*plus or minus 5 degrees from perpendicular to the Mandibular plane*) over basal bone will result in a more stable correction of a malocclusion and they are more likely to remain in good alignment



# A Review of the Literature

Richard A. Riedel

- Theorem 7: Corrections carried out during periods when the patients are growing are less likely to relapse



# A Review of the Literature

Richard A. Riedel

- Theorem 8: The farther teeth have been moved, the less the likelihood of relapse similar to over-correction



# A Review of the Literature

Richard A. Riedel

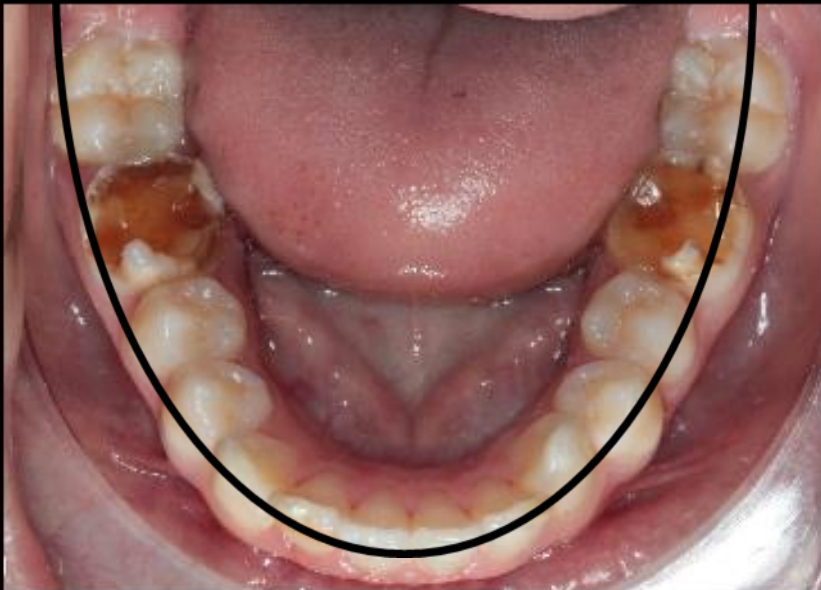
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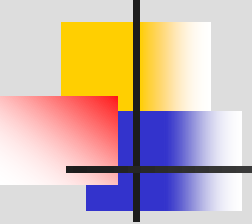
- Theorem 9: The arch form particularly in the mandibular arch, cannot be altered permanently by appliance therapy. Treatment should be directed toward maintaining the arch form presented by the original malocclusion



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- Theorem 9: arch form





# A Review of the Literature

Richard A. Riedel

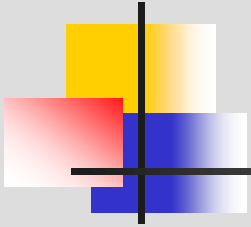
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- Riedel considers the following three rules to be the most important:
  - 1) teeth tend to move back toward their former position;
  - 2) the arch form of the mandibular arch cannot, in the majority of cases, be permanently altered by appliance therapy;
  - 3) bone and adjacent tissues should be allowed time to reorganize around newly positioned teeth

# A Review of the Literature

Richard A. Riedel

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- Other factors influencing the retention of treated malocclusions include:
  - Tooth-size Discrepancies
  - Axial Inclinations
  - Growth
  - Root Paralleling in Extraction Cases
  - Equilibration
  - Musculature
  - Duration of Retention

# A Review of the Literature

Richard A. Riedel

- *Tooth-size discrepancies*

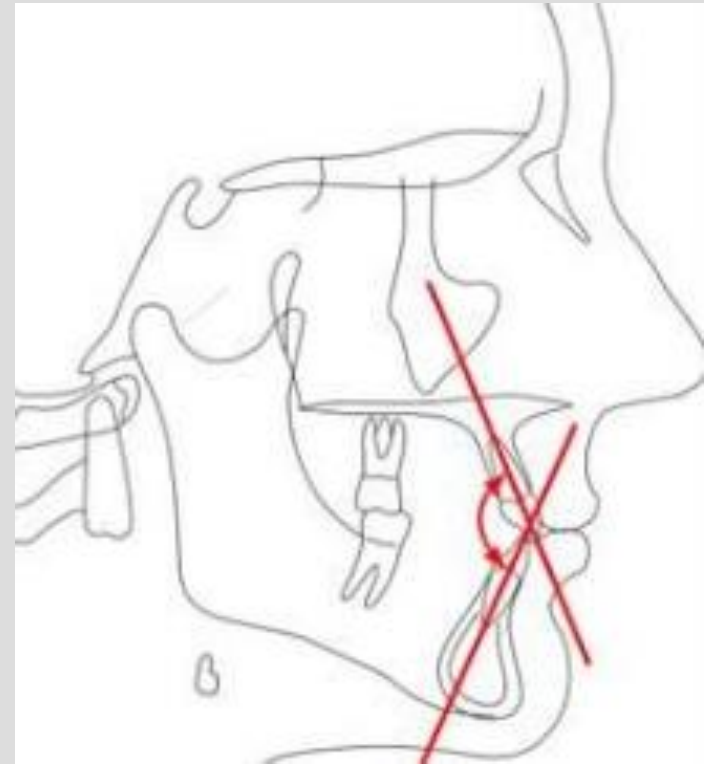
If the maxillary anterior teeth are too large for the mandibular, the maxillary teeth must be placed in one of several positions: deep overbite, greater overjet, combination of greater overbite and overjet, or the maxillary posterior teeth fitting into a more or less distal relationship to the mandible

*Review "Bolton Discrepancy"*

# A Review of the Literature

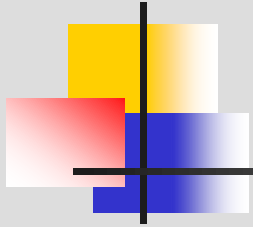
Richard A. Riedel

- *Axial inclinations* - Axial inclination of maxillary and mandibular incisors influences the retention of correction of a deep overbite. Tipping incisors into too upright of a relationship usually results in a deep anterior overbite



# A Review of the Literature

Richard A. Riedel

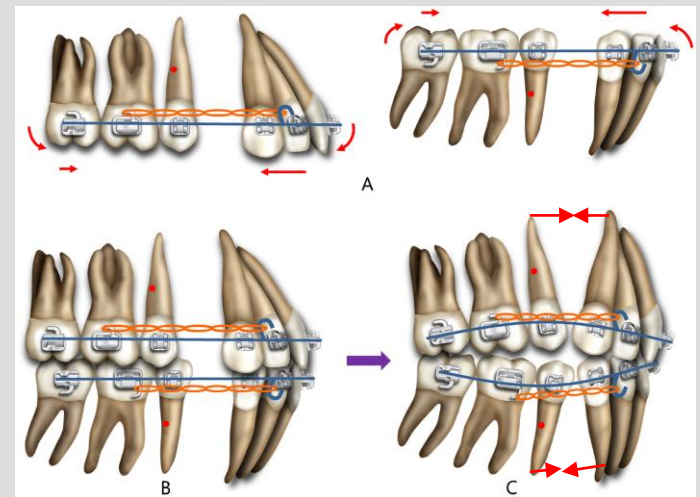
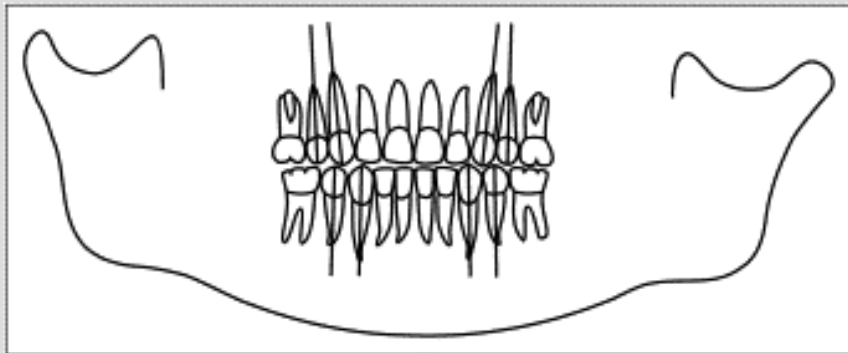


- *Growth and sex differences* - Growth is an aid in the correction of many types of orthodontic problems and it may also be of such character as to cause relapse of treated orthodontic cases. There is a marked difference between the maturation of skeletal and dental patterns of male and female

# A Review of the Literature

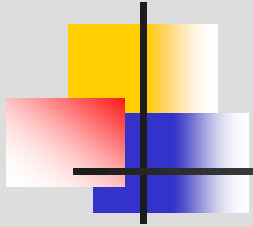
Richard A. Riedel

- *Root Parallelizing in Extraction Cases* - Unless the roots of teeth on either side of the extraction sites are made parallel, spaces may open or teeth rotate due to load distribution on the teeth



# A Review of the Literature

Richard A. Riedel



- *Equilibration* - Riedel is of the opinion that functional interferences as a cause of relapse in treated orthodontic cases has been over-emphasized

# A Review of the Literature

Richard A. Riedel

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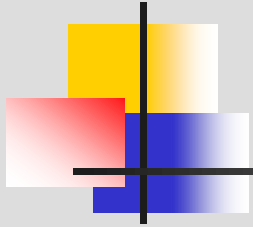
- *Musculature* - We cannot predict accurately a stable position of the teeth with respect to equilibrium of muscle forces



# A Review of the Literature

Richard A. Riedel

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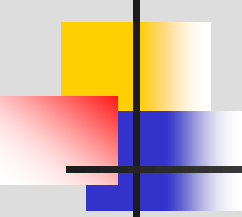


- *Duration of Retention* - The debate concerning the length of use of retention devices has simply not been resolved. It is not known whether prolonged retention provides for greater stability or even if prolonged mechanical restraint is biologically desirable

# A Review of the Literature

Richard A. Riedel

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- 
- Riedel divided retention requirement into 3 categories

Group I: no retention

Group II: permanent or semi-permanent retention in one or both arches

Group III: cases requiring varying lengths of retention

# A Review of the Literature

Richard A. Riedel

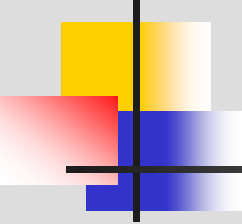
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- Group I: no retention (limited treatment)
  - Anterior crossbite ✓
  - Posterior crossbite after good interdigitation ✓
  - High cuspid extraction cases (extraction only) ✓
  - Cases in which Maxillary or Mandibular molars have been tipped distally or premolars tipped mesially to provide space for the eruption of second premolars ✓
  - Class II cases treated with headgear. Once growth period has passed ✓

# A Review of the Literature

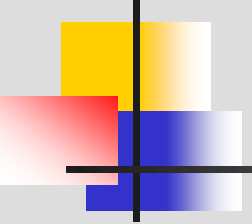
Richard A. Riedel

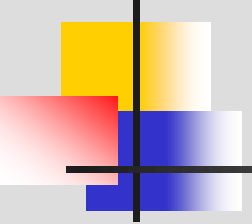
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- 
- Group II: continue permanent or semi-permanent retention in one of both arches
    - Expansion cases ✓
    - Class II or Class III relationship eg. strong Class II elastic therapy ✓
    - Severe rotations ✓
    - Spacing ✓

# A Review of the Literature

Richard A. Riedel

- 
- 
- Group III: cases requiring varying lengths of retention or greater lengths of retention
    - Class II cases extraction or non-extraction cases. If good muscle balance has been achieved and no severe rotations, long-term retention is not necessary
    - Deep overbite: retention is directly dependent on growth
    - Class II division 2 cases
    - Class III corrections with surgery require varying length of retention
    - Cases involving the ectopic eruption of teeth or supernumeraries have been present require varying lengths of retention period

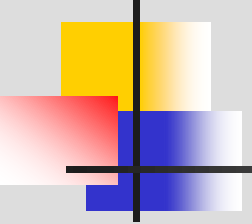


# Perspectives in Orthodontic Stability

## Charles J. Burstone

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- What is a stable dentition? Teeth after orthodontic treatment are not ankylosed to the bone and the supporting tissue allows teeth to migrate under changing conditions
- A relationship between functional occlusion and the pattern of tooth migration

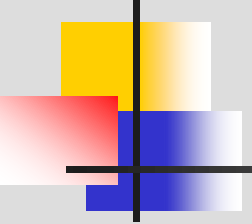


# Perspectives in Orthodontic Stability

## Charles J. Burstone

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- Normal growth, orthopedic changes, and relapse
  - The mandible grows and displaces forward at a faster rate than the maxilla
  - The typical growth helps treatment in Class II, but not in Class III malocclusions

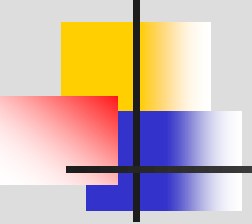


# Perspectives in Orthodontic Stability

## Charles J. Burstone

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- Stability and mandibular rotation during treatment
  - High incidence of relapse in patients with deep overbite
  - In growing patients, the mandible grows vertically more than the maxilla to have enough room for the eruption of posterior teeth

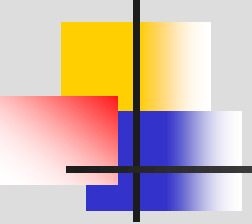


# Perspectives in Orthodontic Stability

## Charles J. Burstone

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- Arch width and stability
  - Depends on equilibrium of many factors



# Perspectives in Orthodontic Stability

## Charles J. Burstone

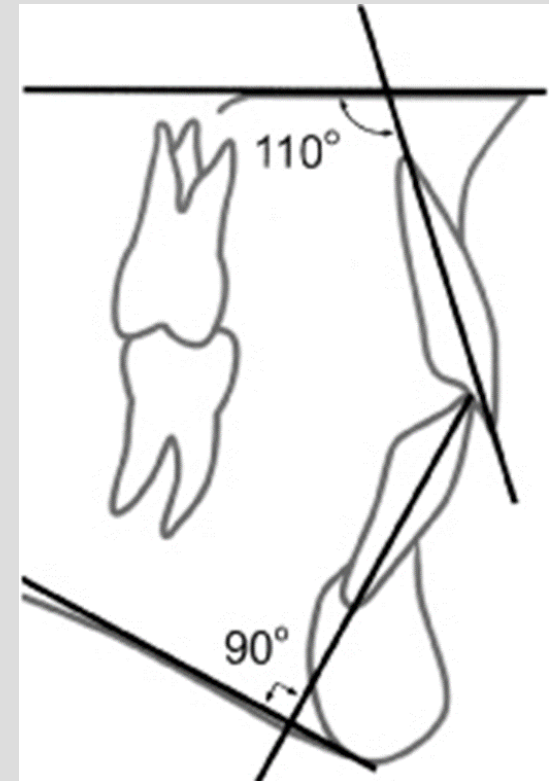
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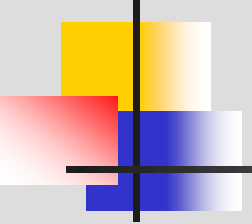
- Incisor position and stability: three dogmas
  - The most stable position for a lower incisors is a cephalometric mean: the lower incisor to mandibular plane is about  $90^\circ$  with a standard deviation of  $5^\circ$
  - The best position for the lower incisors is its original position
  - There is only one stable position of the lower incisor. In fact, the original malocclusion may be the most stable position

# Perspectives in Orthodontic Stability

## Charles J. Burstone

- Incisor position and stability: three dogmas
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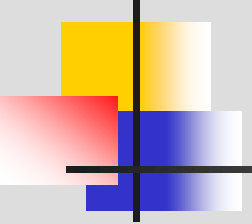


# Perspectives in Orthodontic Stability

## Charles J. Burstone

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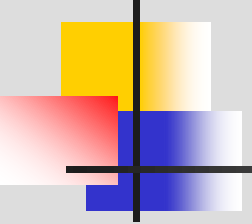


# Perspectives in Orthodontic Stability

## Charles J. Burstone

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- Intra-arch factors and stability
  - Reorganization of periodontal fibers
- Functional occlusion and stability
  - A long centric of 0.5-1.0 mm from the CR is acceptable
  - Multidirectional chewing had minimal migration of teeth

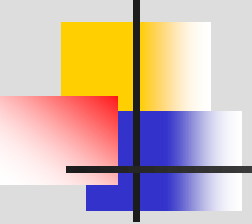


# The maintenance system and occlusal dynamics - Ronald H. Roth

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- Functional vs. Anatomical occlusion

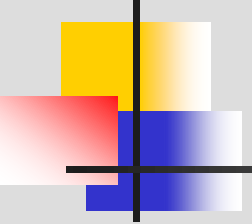
One of the aims of orthodontic therapy is to establish a good functional occlusion that is in harmony with the TMJs and mandibular musculature, along with an efficient masticatory apparatus and health periodontium



# The maintenance system and occlusal dynamics - Ronald H. Roth

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- Criteria for an ideal functional occlusion
  - Maximal intercuspation
  - Stress should be directed down along the long axis
  - The posterior teeth should contact equally and evenly
  - Minimal OJ and OB, but sufficient overbite
  - Minimal interference



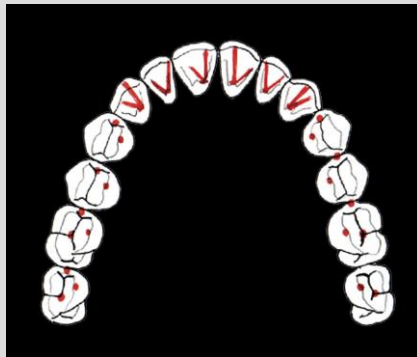
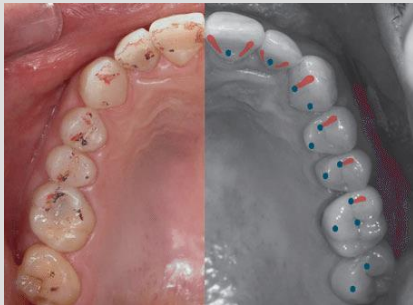
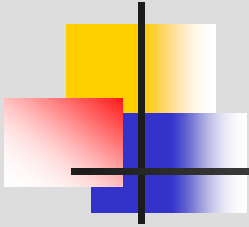
# The maintenance system and occlusal dynamics - Ronald H. Roth

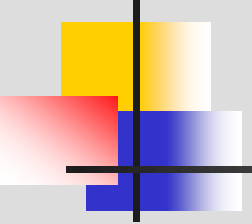
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- Sign and symptoms of occlusal disharmony

Occlusal disharmonies can result in the following symptoms:

- TMD
- Occlusal wear and bruxism
- Excessive tooth mobility and/or periodontal disease (from lateral stress)
- Movement or relapse of tooth positions

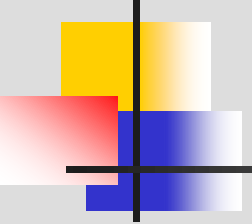




# The maintenance system and occlusal dynamics - Ronald H. Roth

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- Occlusal relationships and post-treatment tooth movement
  - Should have maximum intercuspation
  - 4 types of centric discrepancy
    1. The tooth or inclined plane interference deflects the mandible off the terminal hinge arc of closure
    2. Due to failure to correct the jaw relationship anteroposteriorly
    3. Due to insufficient ramus height or short posterior face height/ skeletal openbite pattern
    4. Asymmetry of the mandible



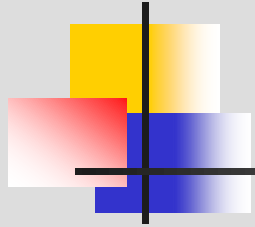
# The maintenance system and occlusal dynamics - Ronald H. Roth

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- Articulation of teeth and mandibular movement
  1. Straight protrusive movement
  2. Canine guidance when lateral movement

# Post- treatment relapse

## Lack of equilibrium



### Periodontal & Gingival tissue

- Reorganization: PDL- 3-4 mos, collagen fiber- 4-6 mos
- Elastic supracrestal fiber- 232 days

### Orofacial soft tissue

(Muscle activity)

- lower labial segment
- arch width
- arch length

### Equilibrium

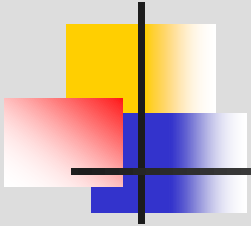
### Post-treatment Growth & development

- Response, dentoalveolar adaptation

### Occlusal factors and forces

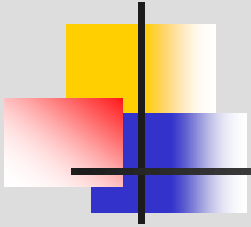
- a well-interdigitating occlusion

# Planning the retention phase - 6 factors



1. Obtaining informed consent: no guarantee
2. Original malocclusion and patient's growth pattern: retention device, long-term stability (CI II, mild CI III, openbite, rotated teeth)
3. Type of treatment performed: removable (6 months), or fixed (1 year)
4. Soft and hard tissue adjunctive procedures to enhance stability: fiberotomy, surgical gingivoplasty, frenectomy, interproximal stripping
5. Type of retention: removable, fixed, passive or active
6. Duration of retention: no clear indication

# Retainers



## ■ Fixed retainers

### Advantages:

- retain corrections of incisor irregularity
- compliance free

### Disadvantages:

- less effective with inherently unstable
- patients are often dismissed
- plaque accumulation
- Technique sensitive (bond failure, stress of wire)

## ■ Removable retainers

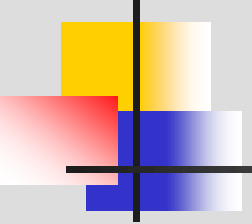
### Advantages:

- cleanness-flossing
- inherently unstable procedure
- the capability of correcting minor tooth discrepancies
- less time- consuming
- patient can easily be weaned from the appliance

### Disadvantage:

- Essix retainers- anterior openbite

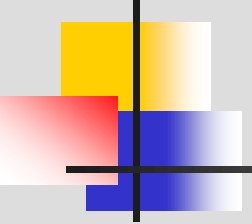
A rationale for removable retainers, JCO 1998, Vol XXXII, No 2  
Comparison of Essix and Hawley retainers, JCO 1998, Vol XXXII, No 2  
A 3 year follow-up study of 3-3 retainers, EJO, 1997



# A 3 year follow-up study of various types of orthodontic 3-3 retainers

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- No difference in the stability of incisor alignment of 4 types of retainers
  - Thick plain wire bonded
  - Thick spiral wire bonded
  - Flexible spiral wire bonded
  - Removable retainer
- 20% failure rate: technique sensitive
- Tendency for plaque and calculus build-up along the wire - no significant difference between baseline and follow-up examination



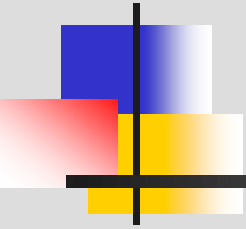
# The ideal removable retainers should be:

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- Able to allow for functional occlusion
- Sturdy enough to withstand long-term use
- Flexible enough to allow normal physiological movement of teeth
- Convenient for orthodontist to provide and maintain
- Patient-friendly in both comfort and wear routine

# RETENTION

## Clinical Applications



# RETENTION

Can be Divided into Three Categories

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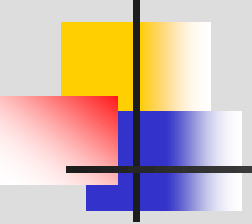
- No Retention Required
- Limited Retention
- Permanent or semi-permanent retention

# Retention

## No retention Required

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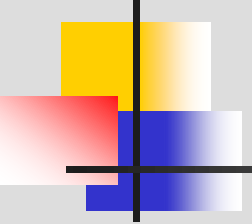
- Corrected anterior crossbites when adequate overbite has been established
- Posterior crossbites if axial inclination is acceptable
- Malocclusions treated by serial extraction only
- Corrections achieved by retardation of maxillary or acceleration of mandibular growth once the patient has passed the growth period



# Retention - Limited Retention

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- Most typical orthodontic cases fall into this category. Time required to allow muscular adaptation and tissue reorganization. However, ideally retention is life-long in treated orthodontic cases.

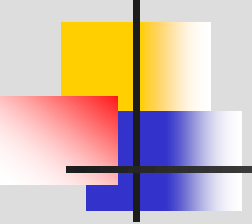


# Retention

## Permanent or Semi-permanent Retention

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- Cases of considerable or generalized spacing
- Instances of severe rotation or severe labio-lingual malposition
- Spacing between maxillary central incisors
- Severe overbite in Class II Div. 2
- Cleft palate lateral expansion



# Retention

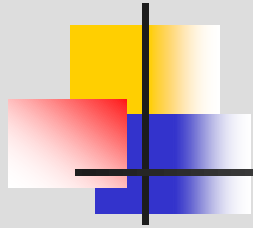
## Retention Mechanics – Three Classes

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- Fixed Retention
- Removable Retention
- Functional Elastic Retainers

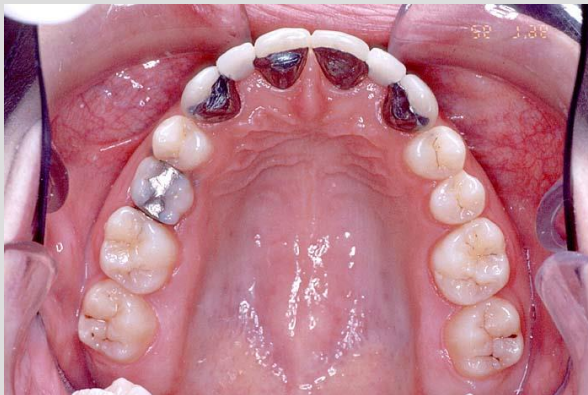
# Retention

## Fixed Retention



# Retention

## Fixed Retention



# Retention

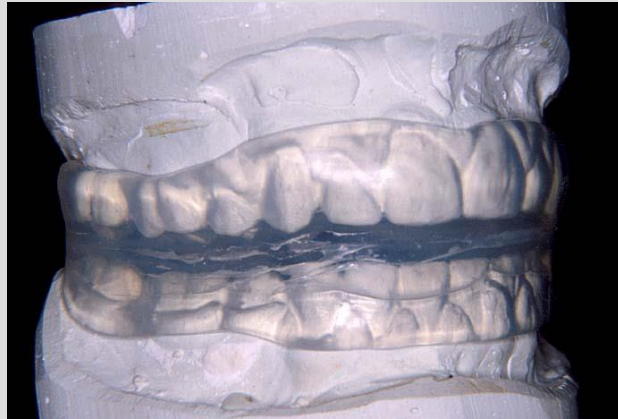
## Removable Retention

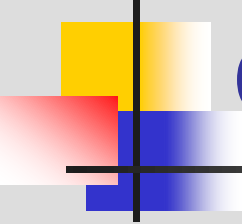


# Retention

## Functional Elastic Retainers

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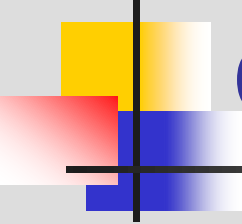




# Retention Conclusion

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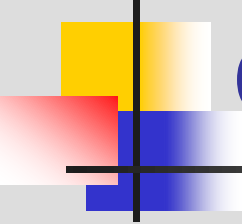
- An interesting and informative method of reviewing the retention problem is to look at some quotes by eminent orthodontists.



# Retention Conclusion

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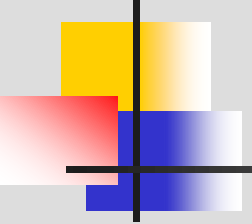
- *"We are in almost complete ignorance of the specific factors causing relapse and failures."* Hellman
- *". . . . That for girls they wear it (retainer) until they get married."* Ottolengui



# Retention Conclusion

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- *"Retention is not a separate problem in orthodontia, but a continuance of what we are doing in treatment."* Hellman
- *"If anyone would take my cases when they are finished, retain them and be responsible for them afterwards, I would gladly give them half the fee."* Hawley



# Retention Conclusion

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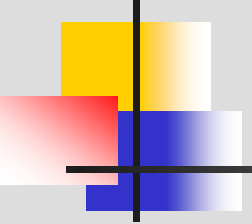
- It is now generally recognized that retention must be appreciated as one aspect of the overall orthodontic treatment. Relapse of orthodontically treated teeth should be viewed not as a pathological or abnormal phenomenon, but as an unwanted or undesirable symptom of normal oral physiology

# Retention

## Direct to Consumer Orthodontics

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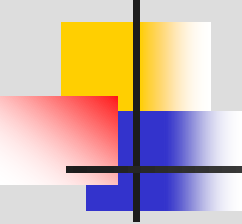
- It is important to make it very clear to your patients that you as a practitioner do not accept any responsibility for retention for their direct to consumer orthodontic treatment



# Retention

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- It is recommended, appropriate and expected in most circumstances to refer a patient back to their orthodontist if there are retention issues.



# RETENTION

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At the end of the Orthodontic course, you have  
neither the didactic or clinical knowledge to  
include comprehensive orthodontic treatment in  
your Scope of Clinical Practice.