9. Posterior teeth with cups, fossae and grooves are the resultant form that follows the demands of function of the temporomandibular joint and incisal guidance.

10. The occlusion should not depend on the proprioceptive mechanism to an unreasonable extent for success. Just what is unreasonable is a moot point.

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Concepts of Occlusion

What Kind of Occlusion Should Recusped Teeth be Given?

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AND

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The purpose of this article is threefold: first, to state the problem; second, to describe and discuss the kind of occlusion the authors believe to be best for teeth; and third, to justify an acceptance of this pattern of occlusion.

THE PROBLEM

Putting prosthetic cusps upon injured or worn teeth so that the dentition will be restored to function is a difficult task. It is a serious problem to change the occlusion of a patient. The technique is tedious and exacting because the dentition must be well related to structures of the cranium, face, and neck. How the teeth come in is important to the periodontium, to the mandibular joints, to the jaw and throat muscles, to the tongue, to the cheeks, to the lips, and to the nerves that help the muscles automate the many gnathic functions. The occlusion built should be such that it will make happy, healthy relations between the dentition and the rest of the gastric organism. Mesh misery has come to patients whose restored occlusion was not organically fit for them. To have a good occlusion, the cusps must be workable yet allow the muscles of the gastric organism to rest.

DESCRIPTION OF THE OCCLUSION RECOMMENDED

Prosthodontic thinking has made it necessary to treat occlusion as though it were a genus which has many species of closures. Balanced occlusion, functional occlusion, centric occlusion, eccentric occlusion, etc.
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etc., are specific closures. The early orthodontists used occlusion to mean the normal closure of teeth. If the closure was abnormal, they called it malocclusion. But today we must use an adjective with occlusion to give it meaning.

It is hard to give the kind of occlusion the writers are here recommending a specific or descriptive name; hence, it is necessary to list its main features below:

1. Each upper buccal cusp occludes in a fossa of its lower fellow.

2. Each lower buccal cusp occludes in a fossa of its upper fellow. The lower cusps and the lower incisors occlude to the fosse of upper cusps and upper incisors, respectively.

3. All the lower teeth close evenly against the upper teeth at the same time about the transverse mesiodistal axis when it is in its rearmost position.

4. In the lateral diagnostic positions of the jaw only the opposing cusps make contacts. In the latero-buccal diagnostic test positions the lateral incisor may also enter into contact along with the cusps.

5. The bite of the incisors should be such that the lower teeth reach centric closure and come to rest stops without any slippage beyond or without having skidded on opposing teeth on the way.

6. The buccal cusps of each tooth make contact in the centric occlusion, but none in the eccentric jaw positions.

7. The multicusped teeth are arranged by occlusion and alignment so that the lower buccal marginal occlusal edges and the upper buccal marginal occlusal edges have no contacts in the centric closure or in the eccentric position of the mandible during the chewing strokes.

PREVIOUS OBSERVATIONS ON OCCLUSAL DETAILS

Centrally related intercuspation of teeth has been regarded essential in coordinating cusps. The ways in which the direction of jaw motion were first demonstrated in isolated data by Schuyler.16 Cusp-related occlusion was described long ago by Black.14 The details of this principle of occlusion were first illustrated by Field.24 The mechanical advantages of having teeth make contact in a mid-face closure but having few occlude in the eccentric jaw closure were first emphasized by Shaw.25

The belief that cusps hard the closure of the rear teeth was stated by John to in 1860. Rellwell added to cusps as guideposts.21 The smallness with which cusps were found obstructing lateral enhancement of buccal cusps was noted even by von Spee.29 It seems that Shaw was first to declare

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that cusps should prevent lateral meshing of the buccal cusps. So far as the writers can learn, Spencer R. Atkinson (1923) was first to state and give proof that cusps prevent the other buccal cusps.2

Preceding ideas about excursive freedom

The belief that lower incisors in complete dentures should not make occlusal contacts in centric closure is old. This idea has been applied to incisors in natural dentitions when the occlusal vertical dimension has been increased. Leaving incisors out of contact allows a progressive excursive movement in the cusps teeth because the vertical overlap of the incisors has been neglected. Similarly it is pointed that centrically occluded cusps will do harm by "interlocking the bite." Leaving cusps out of contact, centro-occlusal contacts negate the occlusal overlap and permits lateral excursive movements of the cusps after closure.2

Negating the vertical overlap of occlusal and incisors to allow or accompany horizontal eccentric excursions as a remnant of the principles of von Spee. It is in line with the belief showing that a horizontal rubbing of the teeth between the teeth. Therefore, to make the horizontal rubbing easier no most-dosed position of the teeth is provided to match centric relation, the "natural eccentricity" is provided. This fear of interlocking of cusps dates back to von Spee, who suggested grinding off the cusps and incisors so as to make the excursive easier.

Before accurate measuring instruments were available and before the methods of taking intra-oral records were refined, the writers concurred that a centric zone of occlusion was allowabie.26 Since the chewing cycle is vertical and since we can now mount casts accurately, a total centric is neither necessary nor advisable. The allowing of cusps to slide about before the cusps and incisors contact excursive movement was justified in the days of inaccuracy. The writers have found that each mandibular cusp should reach its highest closure at its own definite centric relation point. That is the end point of its chewing cycle. To commence a new chewing stroke the mandible will drop downward, they move laterally to reconstruct the food.

To secure the mandible from the jaw points are set and shaped to run in grooves without contact in the eccentric excursive movement. The excursive in front of the condylar path and should compel exertion of the rear teeth. These excursive, however, are used as diagnostic movements made in the mouth or on articulators.

In balancing the excursive excursions were made to ensure that the multicusped teeth make contact eccentrically. In the occlusion herein recommended the excursions are made to see that multicusped teeth make no contact except in centric occlusion. This arrangement does not and cannot cause an interlocked excursive movement, because at the least lateral or provocative movement of the mandible's opening.

12 Excursive (Stallard). A separation of the teeth from occlusion; the opposite of occlusion. Usually it is a periodical movement of excursive clicking

26 Morphological definitions is synonymous with open bite. Physiologic definition is ordinary separation of the opposing teeth to admit food between the teeth.
Previous Concept on Occlusal Anatomy

Early in this century J. Lowe Young advocated putting into occlusal restorations the ridge and groove patterns that molars have at eruption. Young's ideal has now become commonplace practice by Peter K. Thomas and many of his students (Fig. 1). They are able to do this because they have "deciphered the alphabet" of occlusion and mastered its elements. These words were borrowed from Shaw, as can be seen from the quote below:

"The writing cut with such precision upon the complex patterns of teeth may indeed be hieroglyphics, but, even so, it was surely no random and meaningless scribbling. More probably it was a real organic language in which the principles of tooth design and mechanism were inscribed, and we might yet succeed in deciphering it if first we took pains to learn its dynamic alphabet and master the elements."

Some of the letters of the dynamic alphabet are in the condylar horizontal determinants of ridge and groove directions. Several of these letters are in the odontocondylar determinants of cusp heights and fossa depths. These determinants are taken from the patient by the instrumental examination of his mandibular movements and they are stored in the controls of an articulator. The elements are the cusps, their surfaces, their ridges, and the grooves and fossae between them.

Periodontists have wanted to keep the occlusal table of restored molars and premolars reduced. What they mean by occlusal table is the area bounded by the occlusal marginal ridges surrounding the occlusal surface proper. In well built cusped occlusal surfaces the buccolingual diameter of the occlusal table is about three-fifths of the maximum buccolingual diameter of the tooth. In a proper reduction of the occlusal table the lingual occlusal marginal ridges of the upper lingual cusps are carried far toward the middle of the teeth and the buccal occlusal marginal ridges of the lower buccal cusps are carried far toward the middle of these teeth, just as they are in young natural teeth. This is a more effective way to verticalize tooth stresses than by making narrow ugly flat teeth by grinding or by inserting narrow flat restorations.

The shearing principle is widely exemplified in mammalian dentitions. This principle should be used in restorations of human plural-cusped teeth. The molars have incisive edges and ridges which comminute food as if they were small incisors. Chewing by molars is multiple incising. What is sought in most mechanical shearing is a maximum cutting with a minimum of metal contact of edges. From 1914 on Shaw taught that the shear principle is the "dominating character and functional value in mammalian dentitions."

Previous Ideas on Importance of Disclusion

The constancy of maximum occlusal contacts is sought for balanced occlusion in the eccentric excursions. In the occlusion Shaw regarded as desirable, disclusion predominates except in centric closure. The task in restoring occlusion is to make disclusion orderly and so measured that opposing blades can pass closely by and cut the food efficiently.

Some waggish statement has been made that teeth in the healthy do everything possible to keep from contacting their opponents. When the jaw is resting the teeth are discluded. Quiet mouths make occlusal contacts infrequently and then not very firmly. During chewing the food cushions the contacts.

Teeth do their work on the way to occlusion. Occlusion is the end of a chewing stroke. How well teeth are related on their way to occlusion is what makes them fitted for their purposes. Therefore, it is important to give them proper relations just before they occlude. We have to consult their occlusion to see how well they are related in their chewing relations. Occlusion of a dentition is a diagnostic relation.

Previous Thoughts on Musculocondylar Relations

In building or arranging occlusal elements the intercusping of teeth must be related to centric relation, as we have seen. But occlusal elements to have organic relations must be related as well with the horizontal activities of the
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marble, which, for purposes of discussion, may be called horizontal relations. A third set of relations need to be satisfied before an occlusion is fully organic. The vertical relations must be satisfied, both the static and the dynamic.

Von Spee, Monson, 1 and Wadsworth 2 were interested in determining a combination relation between the occlusal curves and the curve of the eminences. Von Spee believed that the evident anteroposterior curves of the cusps and the conical teeth should be a continuation of the arc of the eminence. Monson believed that the anteroposterior curves and also the transverse and Wilson 3 believed that the anteroposterior curves and also the transverse and frontal curves of the cusps should agree with the respective curvatures of the eminences. Wadsworth presented a way on his articulator to locate the arc of the eminence and compute it as a curval curve either anteroposteriorly or transversely. Wadsworth used this principle as a means of surveying the space between the lower teeth. He could do this surveying because he gave a third dimension to the mounting of the upper cast.

The work done by McCollum and the writers disclosed a number of facts about the contours of the eminences so that it became conclusively evident that the curval curves need not be continuations of the contours of the eminences. 4 The conical paths vary in length, slant, and character. They may be straight lines, or either gentle or acute curves. They vary much in their relationship to the true occlusal plane. It would be impossible in many cases and impractical in most conditions of natural teeth to restore the occlusal elements so if the curves of cusps are continuations of the contours of the eminences.

Previous Notions of Occlusal Flow Relations

From the standpoint of theoretical mechanical relations, it has been shown, the same tooth can be articulated at various occlusal plane levels and costs to suit various conical path slants and conical curvatures. The adjustability stems from corresponding changes in the curvature of the curval curve. 5 Hence, given tooth forms do not call for a given curvature 6 in the curval curve.

It is known that the lower the occlusal plane the higher the cusps may be and the deeper may be the fossae. 7 Thus, it is not necessary to change vertical dimension to make the curval curve become a continuation of the contour of the eminences, nor is it necessary to change the vertical dimension to make taller cusps and deeper fossae. 8 A balance can be done to suit the height of the curval curve and the inclination of its crest, the occlusal plane.

Previous Attitudes on Vertical Relations

When centric relation had spotlight attention, it was thought to be the only requirement for stable cusp occlusion. From Wadsworth's time till now some discussions have believed that the occlusal vertical dimensions can be increased with impunity, if done on centric relation. But the artography upon mandibular rest position and the rest vertical dimensions by Trueman 9 has been a warning against over-stuffing the interocclusal space with gold.

1. George H. Wilson, the dentist after whom the "Wilson curve" was named.

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Numerous myographic reports have shown how disturbed muscles become when the occlusal vertical dimension is made equal to or more than the rest vertical dimension.

Former Attitudes on Stereotype Patterns

From time to time in dental history students of tooth arrangements have overtyped their occlusal pattern concepts, as though the same occlusal dimensions could be used by all patients. Mandibular streamlining from a portion of the surface of a four-inch sphere was most typical. This template was to be placed upon the wax occlusion rim to show it properly to guide setting up the maxillary cusps. A few orthodontists have used Post's index materialized into celluloid guide plates to determine how wide to make a dental arch with given frontal teeth. Many orthodontists are using formulae prescribing in degrees how front teeth shall stand in relation to some facial line or to some adopted plane of the mandible.

Tooth manufacturers have stereotyped tooth forms by making cusps with a specified pitch. They have made the cusps of the second molars have the same pitch that the cusps of the first molars have. They have given the same pitch to the cusps of the premolars and they have balanced the pitch of the cusps' cusp should be the guide for all the bicuspid cusps. Stuart 10 stresses how individualistic each cusp of a dentition is. Cusps may look alike but their slopes vary widely in contour and pitch.

In the same dentures the cusps of second molars have pitches differing from those of first molar cusps. The pitches of the premolar cusps are not those of molar cusps. The pitch of the cusp differs from that of any other bicuspid cusps (Stuart and Ayres). A bad procedure in specifying a denture is to change the pitch of the cusp so that it will fit the pitch of the bicuspid teeth and not dissatisfy the lateral diagnostic curvatures (Fig. 2). This is done to make balance of the plural cusped teeth. Such gradings too often make an unhappy denture. But on the other hand, if the pin-anchored gold pin upon the cuspid is convex and not concave in outline, it may be equally satisfactory. It is probably logical to assume that the pitches of restored cusps should depend upon the horizontal and vertical determinants of cusp forms and heights found in the patient. Each cusp is individualistic in matching the dynamics determining its height, slope, and size.

THE NECESSITY FOR VARIATIONS

Exposure of natural dentitions vary widely in many features: in arch width, in arch length, in the curvatures of their cusp curvatures, in the slant of their occlusal plane, in tooth posture in face and cranial relations, in dental and cranial relations, and in the details of interocclusion.

It is easier to work out a cusp-foss relation in an occlusion in which each plural-cusped tooth has but one antagonist, but it is not considered abnormal if each bicuspid tooth occludes with two opponents.

In such a "two-to-two-tooth" relation the mesiobuccal cusps of the lower molars and the buccal cusps of the lower premolars would...
occlude their tips in the embrasures but their shoulders in fossae. Only the molar distobuccal and distal cusps would have cusp-tip–fossa occlusion. The upper lingual cusps of the dentition would keep their fossa occlusion. The upper premolar lingual cusps would occlude in the same fossae, but their posterior shoulders would occlude in fossae of teeth to their rear. The mesiolingual cusps of the upper molars would occlude their tips more distal in the fossae of their antagonists, and

the distolingual cusps of the upper molars would occlude their tips in the mesial fossae of the teeth to their rear.

Any pattern of occlusion that tolerates no variations in details and relations is impossible. But the variations of a pattern of occlusion range well within the scope of a code of principles. Therefore, the principles of a pattern are basic. Variation is necessary to accommodate a dentition’s occlusal elements to the divergences occurring in major interognathic relations, such as centric, horizontal, and vertical.

Variations between tooth alignments and the lip, cheek, and tongue relations are recognized but as yet cannot be objectified so well by instruments.

Simon recognized three categories of dentolabial relations. Though Simon recognized three different positions of the canines in their relation to the orbital plane, he regarded only one as desirable. He thought the canines should have their long axes in the orbital plane. By such indexical thinking he tried to stereotype the relation of the dentition to the jaws and thence to the face and cranium.

Since the teeth are jaw-connected by the periodontium, Simon classified the alveolar process forms and relations into three categories: retracted, “normal,” and protracted. From the standpoint of looks Simon believed that the orthognathic face and whatever relations go with it are preferred.

**JUSTIFICATION FOR AN OCCLUSION**

The kind of occlusion a patient should have can be justified only by how well it subscribes to physiologic principles. Conformation to principles is measurable by how well the occlusion satisfies the five relations a dentition has with the other parts of the gnathic system. These relations may be classified as endodontal, periodontal, musculocondylar, buccolingual, and labiolingual.

**Endodontal Relations**

The pulp of a tooth is an alarm organ. It reports nothing but pain. It gives no directions for automation. Scientists have not proved that the pulp promotes the tooth’s continued eruption after the root is formed. Constant stated that the pulp has something to do with eruption, because he saw how in an adolescent dentition a pulpless tooth erupts not at all or slower than neighboring vital teeth. Orthodontists prefer to deal with teeth that have living insides. Likewise the prosthodontist prefers to save the pulps. He prepares the teeth conservatively to preserve the pulps. He nurses the pulps back to comfort before cementing the restorations permanently. Nothing else cripples a dentition so much or decycles the chewing rhythm so fully as oversensitive pulps. Hence, occlusion should not be painful to the pulps.

**Periodontal Relations**

Occlusion should satisfy periodontal relations. These relations may be divided into two categories, local and general.

The local periodontal relations include the effect of the occlusion upon the gingivae. The ridge relation of the occlusion should prevent food impactions between teeth. The mesial and the distal occlusal marginal ridges should cut the food so well that no chunks form near the divisions between neighboring teeth to be wadded interproximally.
The lingual contour of the upper lingual cusps and the buccal contour of the lower buccal cusps should prevent food slides upon the gingivae. When the lingual and buccal cusp tips occlude in fossae, instead of in the embrasures, the food is held upon the occlusal table until it is cut to bits. (Cusps that end in fossae are called stamps. Cusps that do not end in fossae are called shear cusps.) By having the buccal and lingual marginal ridges of the stamp cusps well related to the edges of the shear cusps, with which they interblade but do not contact, shears are provided to chop the food in such a way that there will be no food slides.

The general relations between the dentition and its periodontium are viewed by seeing how the occlusal surfaces direct and distribute the closure forces. Properly occluded cusps do not deflect or guide the cycling closure direction of the mandible. Specifically, cusps should neither lateralize nor anteriorize the jaw closure position. A fossa receiving a stamp cusp should be nearly midway between the buccal and lingual cusps of the tooth. This fits of cusp and fossa causes the stamping strokes to be aligned with the long axes of the roots and near the middle of the tooth. A stamp cusp should be carried into its fossa and out of it without striking its fellow opponent except in centric closure. It may leave the fossa through three grooves during the diagnostic excursions: the working groove, and two idling grooves. A stamp cusp idles in a central groove during protrusive strokes and in an oblique groove when the other side of the mouth is working. The working groove slopes should make the nearest mises of occlusal contacts. The two idling groove slopes should allow wider mises of contacts.

Ideal occlusal periodontal relations put no horizontal stresses upon the dental ligaments because hard contact is made only when the stamp cusps are travelling in vertical directions. The occlusal arrangement fits the ridge-groove directions as perfectly as he can, as if there were no proposcpeuctive impulses possible from the periodontal ligaments. He may not be aware that new engrains may develop to make it possible to use poorly occluded teeth. However, the best automation can come when supplied the best mechanics. All posture is neuromuscularly controlled, but the best postural mechanics furnishes the best automation.

Musculoclocty Relations

The musculoclocty relations can best be discussed under three headings: centric, horizontal, and vertical relations. All of these relations are determinants of important occlusal features. Centric relation is the determinant of intercuspating and interlapping of teeth. Horizontal relations are the determinants of ridge and groove directions. Vertical relation is regarded as the occlusal vertical and the rest vertical dimension. These are the static aspects of vertical relation. Since we are dealing with moving teeth that are parts of the vertical dimension, we must deal with cusp heights and fossa depths. The determinants of these are in the inclines of the eminences and the overlaps of the incisors and canines. These odontoclocty determinants may be regarded as dynamic factors, since the heights of cusps and depths of fossae are measured during the eruptive movements of the mandible.

Centric Relation, the Determinant of Intercuspation. The best occlusion is best arranged to cooperate with the muscles and condyles of the mandible. The craniummandibular muscles operate the lower jaw. They also operate the condyles in more limited space than they do the tooth-bearing part of the mandible. These muscles move the condyles about in ligament-limited space but carry the teeth in wider limits because they rotate the mandible around axes passing through the condyles. The rotations are limited but in both shadings and rotations the movements of the teeth are sufficient.

The condyle movements are rather accurate—not so accurate as rigidly machined tools, but since the joints last a lifetime, they merit respect as tools. A good occlusion should help the teeth last just as long. The first sign of cusp or blade wear is seen in teeth that deflect the jaw closure movement or in some other way prevent the other teeth from going in the way that the muscles try to move the condyles. This is tooth guidance.

Tooth guidance can be eliminated by intercussing the teeth on the closing axis when it is rearmost and by arranging the cusps so that they do not guide the cyclic movements used in chewing.

When the intercussing occurs at the rearmost position of the jaw, it is said to be centrically related. Hence, wherever in the skull the jaw clasps rearmostly, that cranialmandibular relation is called centric relation. Of course, in chewing and swallowing the only activities that move the jaw rearmostly are muscles.

The only guide we have for intercussing teeth is centric relation, which must be found instrumentally.

Mandibular centric relation is regarded primarily as a determinant of intercussing and interlapping of teeth, but it is also a determinant of the orderly disclusion that goes with good occlusion. The muscles operating the mandible disclude as well as occlude the teeth while shutting and rotating the condyles. Muscular discluding actions separate the jaws to get food between them. These muscles seek their rest during disclusion. Many of these fibers hold the condyles against
the eminences throughout all condyle operatios. If the condyles are carried down the slopes, this action dislocates the teeth. Hence, to begin arranging in orderly manner the right kind of dislocation, centric rela-
tion is the starting point. For, if we start interoccluding teeth on an axis
that is part way down the slopes of the eminences, then we have left
all possibility of relating the teeth horizontally or vertically.

The best occlusion for a dentition, well anchored periodontically,
will best tend to keep its centrically related interocclusions. An occlu-
sion that permits or encourages rapid wearing of the plural-cusped
teeth will soon produce in them unseemliness that become deflectors
of jaw closure. Hence, it is all-important to build with an occlusion the
most orderly dislocation for the horizontal movements.

**Horizontal Relations, Determinants of Ridge and Groove Directions.**

Diagnostic tests of horizontal relationships are made by inducing the
patient to make lateral and protrusive excursions. Of course, patients
don't make such movements in chewing; they, too, make them for self-
diagnosing. The dentist causes these movements to be made to note
the continuation of occlusion in horizontal strokes. The balancers of
occlusion want to have maximum occlusal contacts throughout the
excursions. Your writs want a minimum area of contacts even in the
anterior teeth during these excursive diagnostic tests.

The minimizing of occlusal contacts as the jaw leaves centric posi-
tion is desired:

1. Because teeth are modified and grouped for different tasks. This
minimizing of contacts allows teeth to act freely as specialized groups.
2. Because chewing is vertical near the centric impacts. Lateral
and protrusive movements are made to handle the food and bring it
properly between the teeth.
3. Because lateral sliding of the teeth consists mainly of
multiple incising. It is not saw-edged incising but much like incising
done by incisor teeth.
4. Because eliminating sliding contacts reduces the rapidity
of inevitable wear.
5. Because lateral sliding should be discouraged and vertical
stresses should be encouraged.

The cutting done by teeth is more like the cutting done by shears
than any other common instrument. It is easier for an artist to put
the blades of a pair of scissors tightly together by a rivet and keep
maximum surface contacts than to make the scissors have no edge
contacts but have the edges pass closely by each other in the closure.

But the latter relation of blades makes a better pair of scissors, one
that will cut well and not wear rapidly.

The same principle is true for saws made of cups. The mandib-
ular buccal cups of the maxillary lingual cups are clamp cups. The
mandibular lingual cups and the maxillary buccal cups are shear
cups. It is more difficult to arrange close shearing relations between
stump and shear cups in a no-contact passing than in a ramping
sliding relation.

Making the near contact glide-rips of the occlusal marginal edges is
exact. Making the sudden ridge contact of the stump cup with the
perimeter of the fossa is equally exact. Each point of contact in the
occlusion must coincide with its exact centric relation point.

The directions of the working grooves in which the cupp glide (not
slide) to centric contacts are determined by two static relations and
these dynamic factors. The static relations are (1) position of the cup
in the face, and (2) its distance from the rotating axes (vertical and
sagittal). If the working condyle's axis stood in one place, the grooves
would be simple arcs of circles depending on how much lateral occlusion
occurs, when it begins, and whether it is associated with retraction or
depression.

The directions of the oblique sliding grooves of the stump cups are
modified also (1) by the facial position of the cups running in them,
(2) by the distance they are from the condyle on the other side of the
face, and (3) by the amount, kind, and direction of its lateral occlusion.
The anteroposterior sliding grooves are related to simple protrusion and
lateroprotrusion. As much attention must be given to the details of
occlusion in the sealing grooves as in the working grooves, if organic
occlusion is to be obtained.

**Vertical Relations, Determinants of Cupp Heights and Fossa Depths.**

A discussion of vertical relations falls under two major topics: vertical
dimensions and dynamic displaced intercuspings. We need not discuss
here vertical dimensions because the occlusion near fit for a patient
will not trespass upon the given vertical dimensions. If we pay enough
attention to the dislocative factors, namely, the slants of the eminences
and the overlaps of the anterior teeth, we shall not overfill the inter-
occlusal space. We need to heed the eminence slants affecting medio-
and lateroprotrusion, for they differ from the anteroposterior slants. The
character of the lateroprotrusion may have profound effect not only upon
cusp heights and fossa depths, but upon the widths of the molar fosse.

In pure protrusion the slopes of back eminences and the vertical
overlaps of the incisors determine the dislocative distances between
the excursive teeth. In lateral corrective movements the slant of the
eminence of the opposing condyle and the overlap of the cupp across
the median plane determines the distances between the excursive teeth

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Concepts of Occlusion
A System Based on Rotational Centers of the Mandible

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An occlusal concept must be intimately correlated with the in-
fluencing factors of the temporomandibular articulation and the incisal
guidance. The object of science, whether natural or psychological, is
to coordinate our experiences and to bring them into a logical system.
Merely to conceive an occlusal concept and proceed to construct it
(either in its natural surroundings or upon a mechanical device),
without a complete understanding of the logical systems associated
with masticatory physiology does not, and cannot, justify its existence.
This logical system, in order to be practical, must be readily under-
stood by all, it must give complete command to the operator and
permit him to duplicate, at all times, his efforts and the efforts of
other operators in the field.

By gross observation one finds the mandible capable of a variety
of complex movements, but in one eccentric position (a lateral move-
ment) we can perceive many fundamental principles (Fig. 1). In the
movement, a mandibular bicolp cusp on the balancing or translating
side indicates an inward, downward and forward movement in rela-
tion to its centric seat on the mandible tooth. This is a definite three-
dimensional movement generated by the rotating or working condyle
with primary manifestations on the balancing side. When the reverse
lateral movement is performed the same three-dimensional function
is observed.

These observations suggest that each condylar element of the
mandible is capable of rotation in three dimensions accompanied by

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