MENTAL IMAGERY: THE KEY TO DENTAL ARTISTRY

HAROLD M. SHAVELL, DDS*

Yesterday upon the stair
I met a man who wasn't there
He wasn't there again today
Oh, how I wish he'd go away.
Hugh Mearns
(From the poem "Antigonish")

To extrapolate the above rhyme into the realm of dentistry (written in 1899 by educationalist Hugh Mearns to encourage the natural creativity of children), it might be read as follows. While attempting to carve a restoration, the dentist meets "a man who wasn't there"—i.e., correct morphology. The lack of adequate preoperative visualization has given the dentist a difficult time, and he fails in his attempt to replicate the proper odontological form. Another remedial attempt is subsequently made, and again, the same failure ensues ("He wasn't there again today"). Frustrated by the specter of a "man who wasn't there" and, at this point, willing to accept just about anything that even vaguely resembles the occlusomorphologically correct shape of a tooth, the dentist pleads for the apparition to stay away and not confront him with its reality ("Oh, how I wish he'd go away"). The dentist, now realizing that he is unwilling or unable to properly sculpt the requisite morphologic entity, proceeds nonetheless to forge ahead with no specific guiding visual imagery in mind, consciously abjuring "the man" but secretly haunted by the ghost of what might have been . . . and a dentate morphapocalypse unfortunately ensues.

The great Russian ballerina Anna Pavlova was once asked in a backstage interview to explain the meaning of an exquisite performance she had just given. "If I could say it, do you think I should have danced it?" she observed. Louis Armstrong was once assailed by a fervent youth who demanded of the great musician the meaning of jazz. "If you have to ask what jazz is, you'll never know," was his curt reply. Vaslav Nijinsky, reputed to be the greatest ballet dancer in history, was once asked how in the world he was able to perform the legendary Entrechat Dix, which no other ballet dancer was able to perform. His answer: "I jump up, criss-cross my legs ten times, and when I'm through, I come down."

Dentists, like the querying people in the anecdotes, are increasingly looking for unequivocal explanations and explicit technical detailing, both as students and as clinicians. They want things set down in a rational, analytical fashion that leaves little to the imagination. A literalist mind-set, perhaps even a total lack of imagination, pervades contemporary thought. One of the more dubious successes of modern dental science is the suffusion of our intellectual life with a prosaic and, sometimes, pedantic mind-set. Creative visual thinking simply does not exist; it certainly is not being taught in any of our professional schools.

Imagery and symbolism are the most powerful and ancient means of communication available to humankind. We possess an innate symbol and image-forming propensity that exists as a creative and integral part of our psychic make-up, but also that the human mind evolved this capacity as a result of selection pressures encountered by our species in the course of its evolutionary history.
Anthony Stevens
("Ariadne's Clue")

Students give a high ranking to a lecture if facts are listed in a very orderly fashion and neatly packaged. But such a mind-set is deadly to the processes of creativity and impedes the ability to think, feel, and express oneself symbolically and insightfully. Like Pavlova's

*Retired, 1341 Wessling Drive, Northbrook, IL 60062-4228, USA

DOI 10.1111/jerd.12009

dance, Armstrong's jazz, or Nijinsky's gravity-defying leaps, there are many areas of dentistry that consist of intuition, symbol, nuance, and (yes) ability. In particular, think of the esthetics involved with the scrupulous sculpting of restorations or the spatial esthetics involved in properly intercuspating (choreographing) an occlusion: think, "Occlusal Ballet." These are areas that fairly tremble with a wondrous sense of inexpressible mystery and a difficult-to-express reality because of the problems associated with converting mental imagery (if it exists at all!) to corporeal reality.

However, the literal and unimaginative mind-set dominates scientific expression. Words tend to mean one thing and one thing only. They do not bristle with meanings and possibilities to ignite the imagination, rather they are bald, clean-shaven, and precise. They tell us how much and how far. They are put forth in a linear, sequential, objective, and analytical mode. Our creativity, our dental artistry reflexively become imprisoned by the mechanical contrivances born of this digital technology. This contemporary "wisdom" is like a windowless fortress that keeps people from viewing the world in new, different, and creative ways.

Knowledge may come, but wisdom lingers.
Alfred Lord Tennyson

Literal clarity, orderliness, and simplicity offer a kind of security in areas where, otherwise, things seem incorrigibly complex, ambiguous, and muddy. The result is that we move in the opposite direction from symbolism, supposedly freeing our minds from the alchemist's grip. But at the same time, we strip symbols of their meaning, imagery, and power, thus reducing Pavlova's cosmic dances, Nijinsky's phenomenal antigravity feats (as well as the artistic nuance of the Dental Occlusal Ballet), and Armstrong's melodious riffing, to a literal discussion of vector forces and calibrated amplitudes, rudimentary dentate form, or simple musical notes. However, in response to an inquiry into the working methods of mathematicians, Albert Einstein suggested that:

The words of language, as they are written or spoken, do not seem to play any role in my mechanism of thought. The physical entities which seem to serve as elements of thought are certain signs, and more or less clear images, which can be "voluntarily" reproduced and combined.

Instead of opening up a treasure trove of symbolic imagination, inventiveness, and spatially related thought, the literalist mind-set unfortunately digresses into an ingenuous and one-sided perception of life. The literalist cannot perceive that a methodology without a muse robs us of the true duality of human nature and thought. The literalist mind-set may be likened to the pupil of the eye: the more light shed upon it, the more it contracts. For example, the literalist cannot view intercuspation as an Occlusal Ballet that we must then learn to choreograph to view it as a pas de deux between form (morphology) and function (occlusion). The literalist would have great difficulty relating to the concept that structural beauty must be a determining criterion in achieving successful function.

In 1973 the Russian scientist Leoniv Ponomarev advised in his treatise, **In Quest of the Quantum:**

It has long been known that science is only one of the methods of studying the world around us. Another—complimentary—method is realized in art. The joint existence of art and science is, in itself, a good illustration of the complimentary principle. You can devote yourself completely to science or live exclusively in your art. Both points of view are equally valid, but, taken separately, are incomplete. The backbone of science is logic and experiment. The basis of art is intuition and insight. But the art of ballet requires mathematical accuracy, and, as the renown Russian poet Alexander Pushkin wrote, "Inspiration in geometry is just as necessary as in poetry." The fact is, they complement rather than contradict each other. True science is akin to art, in the same way as real art always includes elements of science. They reflect different, complimentary aspects of human experience and give us a complete idea of the world

 DOI 10.1111/jerd.12009

only when taken together. Unfortunately, we do not know the "uncertainty relation" for the conjugate pairs of concepts "science and art." Hence we cannot assess the degree of damage we undergo from a one-sided perception of life.

It is imperative that we understand that an instinct underlies the esthetic perception of the true artist. This instinct can not be taught, but it can be learned. It is like teaching someone how to ride a bicycle; the art of balancing is very difficult to explain in words. Expressing oneself esthetically in dentistry involves an almost seamless fusion of instinct, mind, and eye . . . the result of perfect training perfectly applied to an already unique creative process.

As Betty Edwards has shown in her remarkable 1979 book, **Drawing on the Right Side of the Brain**, application of the creative process in any form of human endeavor (and especially applied to dentistry) demands a "viewer shift to the artist's mode of perceiving." Edwards focused on disregarding preconceived notions of what the drawn object should look like and on individually "seeing" edges, lines, spaces, relationships, lights, and shadows, later combining them and seeing them as a whole, as a gestalt. That is, one must shift to a different-from-ordinary way of processing visual information—away from a verbal, analytical, linear, sequential, objective, one-sided perception of life (left-brained or "L-mode") toward more spatial, global, nonverbal, intuitive, and insightful processing (right-brained or "R-mode").

The learned is happy to explore,
The fool is happy he knows no more.
Alexander Pope

In developing our ability to cognize this left-brained to right-brained, or L-R shift, Edwards explains that we begin to free the extraordinary functions of the right brain hemisphere. The left brain is sensible, direct, hard-edged, unfanciful, and agonizes over time. By contrast, the R-mode is curvy, flexible, more playful in its unexpected twists and turns, more complex, fanciful, and more capable of synthesizing space. It deals in metaphors, insights, and dreams. The key then to learning esthetic form is to concentrate on those conditions that will cause you to affect a creative mental shift—utilizing abilities that are naturally a part of you—which will allow you to process the visual information in an entirely different perceptual mode. Roger Sperry, the 1981 Nobel Prize winner in medicine for pioneering research into the differing functions of the brain's two cerebral hemispheres, once explained:

The main theme to emerge . . . is that there appears to be two modes of thinking, verbal and non-verbal, represented rather separately in the left and right hemispheres, respectively, and that our educational system, as well as science in general, tends to neglect non-verbal form of intellect. What it comes down to is that modern society discriminates against the right hemisphere.

It seems nothing has really changed. As an essentially cause-and-effect literalist education gains control of our minds, we lose the need or desire to express ourselves pictorially and graphically. Language displaces imagery because art, drawing, and craftsmanship are no longer vital skills for survival in our culture. Sadly, adults in the Western world do not generally progress in their artistic skills much past the level of competence they achieved in grade school; they have a one-sided perception of life, the result of societal discrimination against the right side of the brain.

Every child is an artist.
The problem is how to remain an artist once he grows up.
Pablo Picasso

No matter what level of education or success they may have achieved in other areas of life, most adults draw like children and possess few perceptual skills. Visual imagery is almost totally unnecessary and, hence, lacking in this literalist world; people tend to unwittingly relinquish original creation and personal expression. At the same time, they lose the ability to see in a particular way to perceptually process visual information as the artist does. Just as we have dyslexia in language, we can have dysgraphia in writing,

DOI 10.1111/jerd.12009

dyspictoria in art, dysmorphia in anatomy, and dysfunction in occlusion. It is the same kind of disability. Unfortunately, dentistry cannot truly flourish in such an environment. An inconvenient truth is that most dentists cannot faithfully replicate human dentate form; they have difficulty in conceiving, for example, that the occlusal geometrical configuration of the maxillary teeth is rhomboidal and that of the mandibular teeth is trapezoidal. A simple truth (although a pure and simple truth is rarely pure and never simple): If you can not visualize it, you can not draw it, and if you can not draw it, you can not carve it. Drawing is not a question of copying, but of interpreting reality in a simpler, more luminous language. Thought is the sculptor. You must always begin with the end in mind (**Figure 1**). Apathy is the glove into which creativity is allowed to slip its hand.

I dream my painting, then I paint my dream.
Vincent Van Gogh

Dental occlusomorphologic imagery is, by and large, absent. If most dentists cannot conceptually visualize and draw the teeth they attempt to repair, if they cannot mentally pictorialize morphologic form and draw teeth, how then are they able to properly sculpt restorations, fabricate provisional restorations, critically analyze work returned from the laboratory, or correctly intercuspate and adjust an occlusion? If you keep doing things like you have always done, what you will get is what you have already got. Yet, replicating human dentate form is the sine qua non of all dentistry. It is the knowledge and will of the dentist expressed spatially; it objectifies right-brained thought. Sadly, although not having mastered the L-R shift, most dentists precipitate some form of malocclusion with every restoration placed. Dentistry cannot continue to expand and flourish creatively when constrained by a left-brained mind-set in an environment that lacks visual-spatial function, pattern perception, and fine-line discrimination. It cannot continue to ignore the duality of the brain's function.

Visual imagery and perception is crucial to dentistry. Visual imagery is the art of seeing what is invisible to others. How we see is as important as what we see. It is not what we look at, but what we actually "see," that counts! The eye does not "see" what the mind has not taught it to recognize; hence, not every closed eye is sleeping, and not every open eye is seeing. Then, there is the enigma of memory: we must be equally concerned with remembering what we have seen, as with the act of seeing itself, allowing that there is one kind of memory for pictorial material and another for the linguistic. It must be understood that pictorial material is devoid of language and is maintained without labels, words, names, or even the need for rehearsal. Because the pictures are not stored in words, they cannot be recalled in words either. A very difficult situation exists then. Imaging is a jealous mistress, and we are losing our ability to image through disuse atrophy. Moreover, in those in whom the process is intact or may even be blossoming, transmitting that ability becomes a moot point. Language may be satisfactory to explain details and technique, but it cannot adequately convey perception and visualization. Dental artistry suffers again.

For all sad words of tongue or pen,
the saddest are these:
"It might have been."
John Greenleaf Whittier

Relatively little attention has been given to considerable cross-cultural investigations performed initially at the turn of the 20th century among nonliterate people that sought to explain a so-called primitive form of imagery, eidetic imagery (from the Greek "Eidetikos," pertaining to images) that was, and is, not as prevalent in Western civilization. Eidetic imagery, as propounded by researcher Akhter Ahsen in 1965, represents an experiential system of complex mental structures and dynamic image formations that demonstrate various functions and operations of the mind and body. It discovers imagery blueprints in the psyche, locates them at their source, and traces their tributaries. As the images are studied and reveal what they do at various levels, it becomes clear how different images affect the emotions and the physiology differently, and why . . . as dynamic images are most central to human activity and expression. Entering the image arena with full awareness of the principles through which imagery operates, we are able to interface with its infinite

 DOI 10.1111/jerd.12009

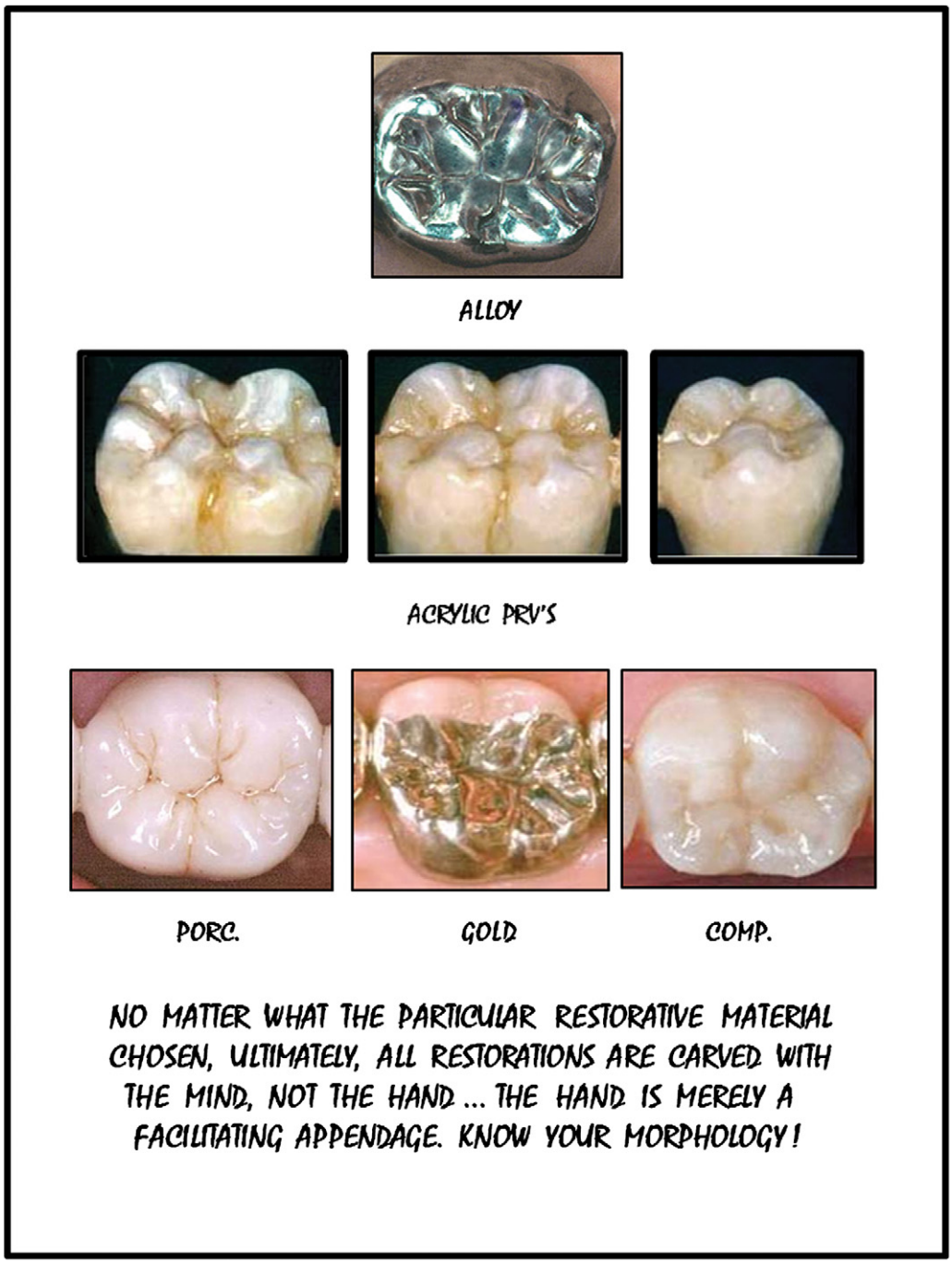

FIGURE 1. Of the restorative materials displayed, the only "signature" restoration is the direct silver alloy. It is the only restorative that acutely tests the psychodigital ability of the dentist to make his or her morphologic and occlusal concepts structurally visible within a given (restricted) period of time, after which no carving is possible. Wax and composite can be altered, porcelain can be rebaked. Only the direct silver alloy restoration offers prima facie evidence of how the dentist perceives shape and form, transmitting mental imaging to clinical reality before the final alloy "set." It then becomes the personal signature of that dentist.

DOI 10.1111/jerd.12009

possibilities and create change along the lines we want or desire. These are images that are reported to appear as photographs in front of the eyes, whether or not the eyes are open, to persist after stimulation by an external stimulus for a period of time generally longer than an ordinary after-image, and to be scannable, positively colored, and independent of visual fixation. Eidetic imagery is, then, the "Rosetta Stone" of dental artistry. Sadly, however, many dentists begin their restorations having made no previsualized image formation of the end result; similarly, some men go through a forest and see no firewood. In either case, the results are necessarily meager.

The woods are lovely dark and deep.
But I have promises to keep,
and miles to go before I sleep,
and miles to go before I sleep.
Robert Frost

Although the subject has, for the most part, been neglected since 1935, scholarly interest in visual imagery seems to have been renewed recently. This is particularly true in connection with the question of how images facilitate perceptual memory, which is different than memory alone. It seems only natural, then, to look again at eidetic imagery, the most enduring and complete kind of mental imagery. Eidetic images have been distinguished from memory by their preservation of exceedingly fine detail, which is usually lost in memory alone. One of the most striking aspects of eidetic individuals is the completeness and vividness of the image that was "out there," localized in front of their eyes. However, if they sought to name, label, identify, rehearse, or actively attend to the items being visualized, the image faded. This seems to indicate that these individuals are actually mentally seeing something rather than just remembering it!

Stop for a minute and consider the two areas of dentistry I mentioned previously, the aesthetics of occlusion and the sculpting of restorations, as they may now relate to eidetic imagery. Think of leisurely carving the fine details of a complex restoration with ease, as if you were actually copying a vivid mental picture that you had visualized specifically for that procedure! Or think of the facility with which you might dispatch that nagging occlusal imbalance, diagnose the maddening persistent occlusal wear problem, or identify the correct intraoral tripodal contacts of a class II malocclusion simply by calling forth the appropriate Linguovision imagery. In other words, being able to "view" the clinical situation much as we would in the laboratory, when we turn the articulator around (You have to "see" there to "be" there!) and examine the occlusion from behind, that is, viewing the "Linguovision," (i.e., viewing intercuspation from the lingual) that really is a facilitating visualization (**Figure 2**). Scannable imagery. Eidetic occlusion!

By and large, however, eidetic images are negatively correlated with age and hence discoverable among children, but only very rarely among adults: a perfect example of the effect of societal discrimination against the right brain. This is a modern tragedy as eidetic imagery, having survived from some earlier evolutionary age, has become virtually functionless in modern adults who have been taught to disregard "unimportant" (right-brained) visual details and to retain only the verbally relevant and "essential" (left-brained) information. In the face of all this evidence, it seems quite logical that a paint-by-the-numbers, art-in-a-hurry, punk, funk, and junk digital mind-set has not only taken over our culture but reflexively our dental artistry as well. "Time and efficiency," and bottom line profitability in dentistry, especially in this current precarious economy, leave little attention for the right-brained pleasure, where every restoration should be the utopian reintegration of lost morphotypia via biomorphomimicry, dutifully paying its tithes to the dignities of the periodontium, the morphology, the occlusion, and the overall a aesthetics.

Quality is never an accident. It is always the result of intelligent effort. There must be the will to produce a superior thing.
John Ruskin

Because it is the unquestioning acceptance of the already-existing that keeps people from being creative, what can YOU do to shake yourself out of the ruts of

 DOI 10.1111/jerd.12009

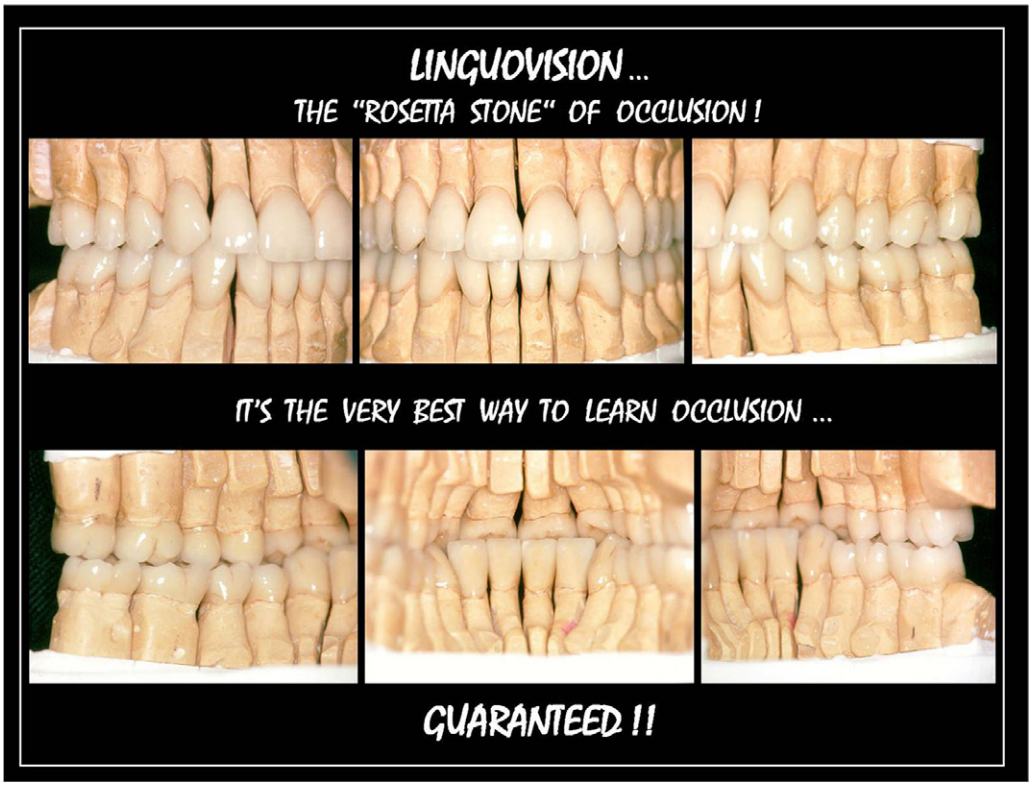

FIGURE 2. Indisputably, imaging proper morphologic form is the key to gaining the knowledge required to successfully (and esthetically!) treat problems arising in what is the quintessential common denominator in all dentistry—occlusion. Moreover, evaluating the intercuspal "Ballet" from the lingual perspective during laboratory fabrication is like viewing a performance of the "Corps de Ballet" from "behind the curtain." LINGUOVISION! It is without any doubt the very best way to learn occlusion—guaranteed!

ordinary perception? What can YOU do—as Aldous Huxley asked—"to be shown for a few timeless hours the outer and the inner world, not as it appears to the human organism obsessed with words and notions, but as it is apprehended, directly and unconditionally, by the 'Mind at Large'?"

Engendering an absolute, depersonalized, factual recognition of the significance of mental imagery will be the initial prerequisite for subsequent realistic esthetic revelation. You must be willing to abandon what you have already learned to do well and become a beginner again; this will demand the ultimate in artistic discipline. Time will exist only from accomplishment to accomplishment because there is no other form of reference for the artist. Our work is the creation of our mind. In the act of creation, time must stand respectfully aside. You actually will have to sacrifice outside-world time in order to measure accomplishment time. Ultimately, however, you will find the compensation far greater than you now dare to dream!

You will have to put aside reigning concepts in dental artistry and learn to listen only to your own intuition. You will have to put aside reigning conventional "wisdom" as it is the crystallization of popular beliefs that breed paralytic mediocrity. This consistency is the hallmark of the unimaginative. You will have to learn to mentally perceive morphologic form not merely as a subject of formalist exercise but something indeed capable of being transformed into corporeal reality. You will begin to translate knowledge into three dimensions. Furthermore, because the eye has difficulty in seeing what the mind has not taught it to recognize, judgment of only the "unacceptable" end product of your biomechanical, psychodigital endeavor denies the duality of your brain's function . . . you must

 DOI 10.1111/jerd.12009

concentrate more on the "L-R shift." You may unfortunately be thinking too literally. You must not ignore how you originally saw your work, how you initially conceptualize the totality in your mind's eye prior to beginning, as the road to success is always easier when you know where you are going.

It ain't what we don't know that's the problem.
It's what we think we know, but ain't.
Mark Twain

However, choosing possible academic considerations in the selection of long-range perioprosthetic treatment, choosing centric registration procedures, planning integrative occlusion, performing finite occlusal adjustments, and evaluating of the final overall aesthetic appearance, etc., do NOT include phrenology, flying saucers, Sasquatch, divining rods, the Loch Ness Monster, Nostradamus, levitation, bunk, bupkis, baloney, bamboozle, sorcery, flimflam, palmistry, the Lost Continent of Atlantis, casuistry, the Bermuda Triangle, or any other kind of fulminating factoid.

Rather, you must first internalize that morphology is the common denominator of all occlusion, its precursor, and that inimical occlusal interferences are its plague. You must realize that morphology and occlusion are two sides of the same coin. Morphology is the handmaiden to occlusion; it is the dress of occlusion. You must not miss the crucial point that the two are indivisible: the way you work and the way you see spring from the same source. How you see is as important as what you see. Morphology is the foundation and the pedigree of occlusion. Ignorance of morphology is occlusion's misfortune. Lamentably, we have gone from the impetuous, feisty, and knowledgeable "OCCLUSION!" Sturm und Drang of the 50s, 60s, and 70s to the regrettable death of the discipline via "cosmetic" default. To wit, although a plethora of "esthetic/cosmetic" courses abound, regrettably, our schools (and postgraduate courses) suffer a critical lack of adequate "Form and Function" imagery education in morphology and occlusion. Visualizing morphology is tantamount to power by means of forms. It has been previously noted that most dentists cannot mentally visualize and faithfully replicate human dentate form. The inevitable clinical result is incondite restoration dysmorphia. Once again, if you can not "see" it, you can not draw it, and if you can not draw it, you can not carve it. Morphology and occlusion suffer. You always have to begin with the final image (vision) in mind. Remember: Thought is the sculptor, the parent of the deed. The mind can see what the eye cannot. Conversely, the eye cannot see what the mind has not taught it to recognize. It's the retina-brain default connection. Imaging is not a problem to be solved but a reality to be experienced. However, experience teaches slowly and at the expense of many failures.

If there is no "Occlusal Ballet" playing before your eyes, the delicate occlusomorphic pas de deux begins to falter as cusps become shorn while stumbling awkwardly over one another as form (morphology) and function (occlusion) ignominiously collide in jolting antagonism, sparking cumulative cuspal ricochet. However, enabling the morphologic "L-R shift" will ultimately allow you to do complete-mouth occlusal rehabilitation on a semiadjustatable articulator, as you will have successfully engendered a fully adjustable brain (**Figure 3**)! You ideated, then you created! The "L-R shift" means that restorations are carved with the mind not with the hand—the hand becomes merely a facilitating appendage. To do easily what is difficult for others is the mark of (right-brained) talent. The most exciting place to discover this talent is in yourself!

No bird soars too high if he soars
with his own wings.
William Blake

I have alluded to the fact that the art of dentistry, like the arts in general, cannot be "taught" in any formal or structured sense, but it can be learned, which is a much different thing. Conversely, we somehow believe that everything that can be learned can be taught, which is a huge fallacy and a misconception. It is difficult, if not impossible, for most dentists to think otherwise than in the fashion of their own period in time. It is the Peter Pan Syndrome. A thing is not necessarily true because some "expert" says so. Facts are not science, any more

 DOI 10.1111/jerd.12009

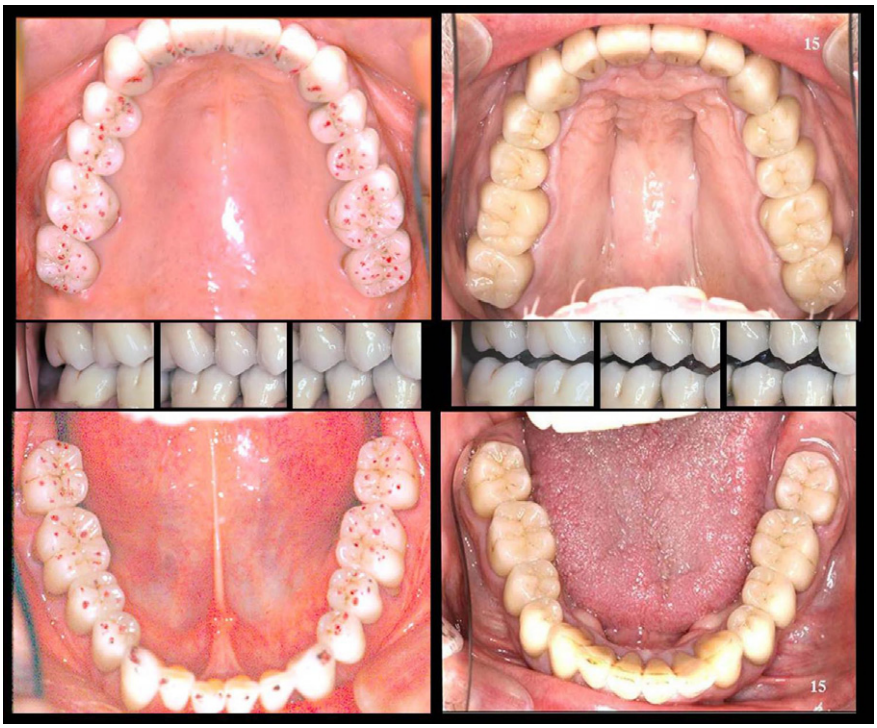

FIGURE 3. Left case "A" (top and bottom): Pinpoint occlusal contacts confirm synchronous Centric Relation-Centric Occlusion (CR-CO) repetitive nondeflective closure to centric intercuspation. Right case "B" (top and bottom): Extant morphologic form at 15 years, confirming that time need not be the thief of morphology, given mandibular centricity coupled with canine disclusion. Center case "C" (left and right): Choreographing the "Occlusal Ballet." From the "en pointe" (centric position) to a lateral pas de deux movement (canine disclusion) is not an ensemble movement! Note that in case "A" (top), the only faceted teeth in lateral movement are (correctly!) the canines. Ensemble (group) function ultimately begets ensemble (group) destruction. Sadly, it is left-brained choreography for a Never Never Land occlusion. Think morphology preservation!

than the dictionary is literature. Obviously, there are some disciplines that do require formalized training; but even here, it is the inherent "shape of the mind" more than a particular course of study that separates the plodders from the paragons, the artificer from the artist. Eventually, you will soon come to experience what Frank Lloyd Wright taught us years ago: "Form follows function is mere dogma until we realize that form and function are really one," to which I would add—inextricably interwoven, flawlessly fused, and beautifully bound. Expressing oneself aesthetically in dentistry involves an almost seamless fusion of instinct, mind, and eye, the result of indefatigable training diligently applied to an already unique creative process—the "L-R shift." Frankly, left-brained creativity is essentially a lonely art and an even lonelier struggle. To some, it is a blessing. To others, it is a curse. In reality, it is the ability to somehow reach deep inside yourself and drag forth from the very depths of your soul a concept, an idea, a vision (**Figure 4**). The greatest obstacle to birthing and perceiving this vision is not inability; it is phlegmatic indifference.

Vision is the art of seeing what is invisible to others.
Jonathan Swift

Unfortunately, there is no easy solution to this L-R historical/conceptual dichotomy, or the technical/visual schism thus elucidated. In fact, unless we cease this head-long rush into quantum dentistry, digital readouts, and Cad/Cam robotics, the solution may not only be difficult but altogether a real impossibility. We must continue to strive not only for individual technical competence but to also release the ineffable imagery skills we already possess but are simply waiting to be released . . . or we remain tethered to a one-sided perception of life. As such, we may be doomed to a

DOI 10.1111/jerd.12009

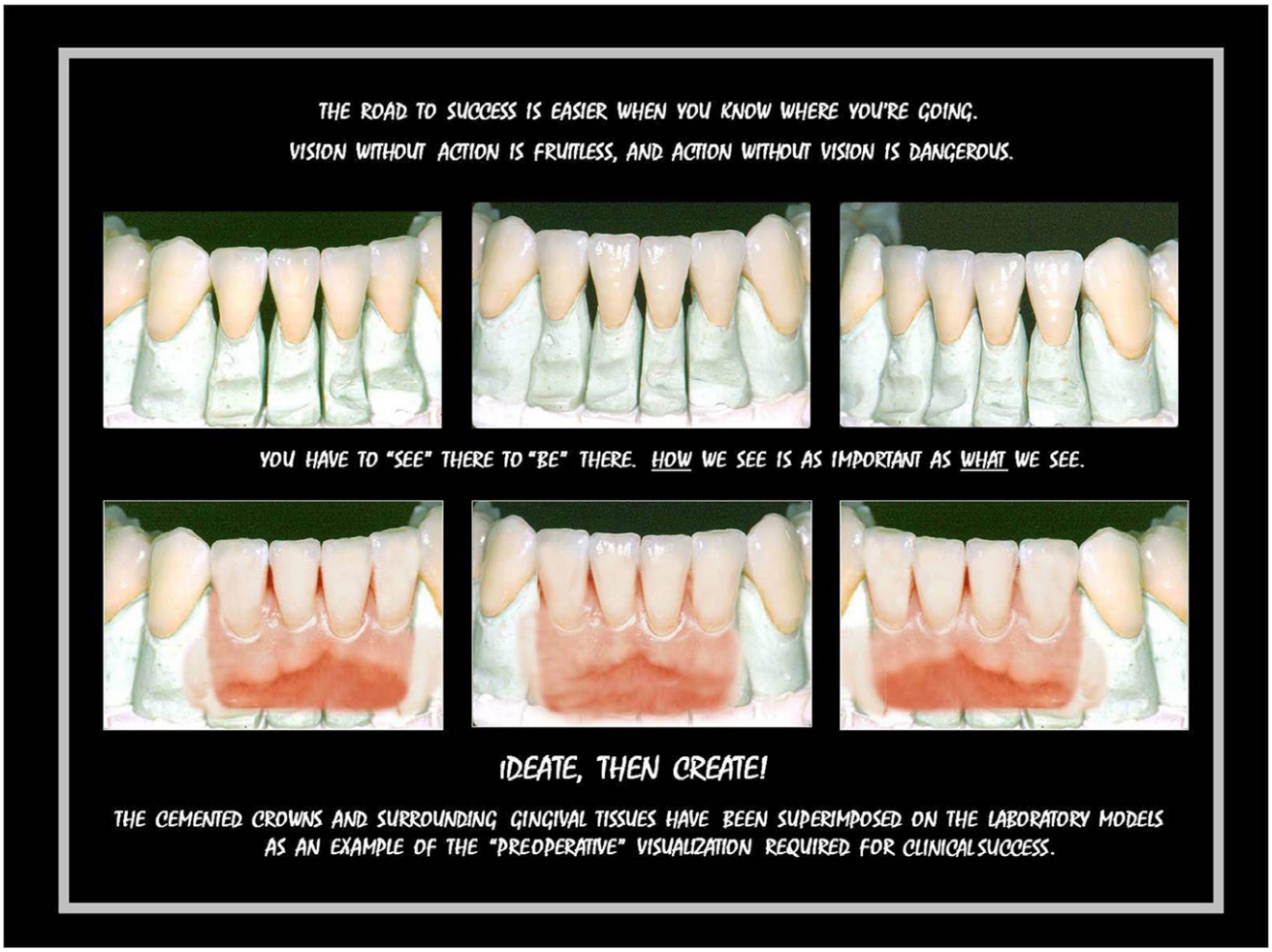

FIGURE 4. As an example of visualizing the "L-R shift" imaging process in picturesque fashion, a photograph of four completed ceramometal crowns and surrounding adnexal tissues have been superimposed on the laboratory model. Preoperative ideation such as this averts subsequent clinical miscues. The mind can paint what the eye cannot see.

left-sided, fixed-rudder approach to learning which will bring us ever and again to repeating endlessly the same repetitious circle of educational confusion. The penalty for artless dentists who refuse to become involved with dental aesthetics is to be imprisoned by a technodigital mind-set taught by artless dentists. Mediocrity is voluntary misfortune. Discontent is the first necessity of progress. Ideas are the roots of creation; the thoughtless are always going to be prisoners of other people's minds. Knowledge is limited . . . imagination is limitless. The trick is to combine your waking rational abilities with the infinite possibilities of your dreams. Indeed, imagination, visualization, and creativity may be more important than knowledge. The unquestioning acceptance of the already existing is what keeps people from being creative. Advances are made by answering questions. Discoveries are made by questioning answers.

The power of imagination makes us infinite.
John Muir

To become a confidant of the natural world, we must awaken our minds and eyes to the omnipresent lovely "language" of shapes, forms, and spatial relationships, and we must learn to think and express ourselves in that "language." In the act of creation, time must stand respectfully aside. Oftentimes, the right brain, by means of its stylistic expression, can show the left brain where its problem is hidden—if we are but able to decipher

 DOI 10.1111/jerd.12009

the message so produced. Unfortunately, visual thinking dies the moment it must objectify the subjective and create corporeal reality. As concerned professionals and teachers, we must search for teaching techniques that will enhance intuitive and creative powers. We must prepare our students to meet new challenges with flexibility, inventiveness, and imagination . . . and with the ability to visualize and pictorialize through mental imagery. As noted, classically dentists are deficient in comprehensive diagnosis and complex, long-range treatment planning. How can dentistry flourish in an environment that lacks visual-spatial function, pattern perception, and fine-line acumen?

How often people speak of art and science as though they were two entirely different things, with no interconnection. An artist is emotional, they think, and uses only his intuition; he sees all at once and has no need of reason. A scientist is cold, they think, and uses only his reason; he argues carefully step by step, and needs no imagination. That is all wrong. The true artist is quite rational as well as imaginative and knows what he is doing; if he does not, his art suffers. The true scientist is quite imaginative as well as rational, and sometimes leaps to solutions where reason can follow only slowly; if he does not, his science suffers.

Isaac Asimov

What happens to the art and science of dentistry when all the recorded diagnosis and treatment planning information cannot be conceptualized? When there is no visual thinking? When visualization, if it does happen to take place, cannot be transformed into corporeal reality? As I have labored to show, digital technology has possibly committed a wholesale suffocation of artistry, visualization, and creativity in dentistry. We have apparently lost the need or desire to express ourselves pictorially, graphically, and artistically, as a cause-and-effect, hard-edged, unfanciful, technical education has gained control of our minds. Imagery, drawing, and craftsmanship are no longer survival skills in our technologically advanced culture. Hence, visualization, in particular that innate ability to recall and construct visual images within the mind, undergoes progressive disuse atrophy, as we progress from child to adult and from generation to generation. Creative insight remains forever dormant in the kaleidoscopic

FIGURE 5. Top and bottom: Cognitive perseverance, imagery, creativity, and technical skill have morphed into perioprosthetic clinical reality, shown at 7 years. Although the work of creation is never without travail, should the presenting case difficulty preclude allying ART (right brain, imaging, morphology, form) with SCIENCE (left brain, research, facts, function)? Absolutely not! Both sides of the conjugate pairs are required for successful clinical results. Tissue response always speaks the truth. Center: Evaluating intercuspation via "Linguovision" during laboratory fabrication.

DOI 10.1111/jerd.12009

(but malnourished) right brain hemisphere, whereas the computer-like left hemisphere is permitted to gorge on a number-rich (but pattern-poor) diet. With having a greater exposure to right-brained lateralization, the ability to grasp complex arrays of interconnected spatially related ideas and facts, to perceive underlying patterns of events, and to see old problems in new ways will be dramatically heightened.

Our profession demands that we be servants of a profound nostalgia for spatial orderliness, structural beauty, and fluidity of form. Our profession demands that we must always labor to keep alive in our hearts that little spark of celestial fire called passion. As dentists, we seek to classically protect an organ system ever on the brink of disintegration through (abnormal) wear. Time is the thief of morphology. Time is like a tailor specializing in alterations. We collectively must feel a sense of sadness and loss knowing that nothing remains unviolated by time and that there is an inexorability of change. Our concerns, then, must be for the islands in time's streams and for the endless erosion that overtakes them. As such, we must stop merely flirting with imagery, form, and function—and begin to actively and passionately pursue an insightful, right-brained viewer-shift to the artist's mode of perceiving in order to stem time's tides and preserve the structural beauty that our dental artistry seeks to create for our patients through right-brained lateralization. A man's mind, once stretched by a new idea, never returns to its original dimensions.

Tell me and I forget.
Teach me and I remember.
Involve me and I learn.
Ben Franklin

Dentistry is not now, and will never be, an exact science, and the strict oral implementation of rigid mechanical instrumentation is to be harshly condemned. The human mind may venture forth to seek the essence of this statement but brings back merely metaphor instead. Given the array of technically sophisticated, digitalized electronic instrumentation that is currently available, the thought that by their mere possession one can soar to amazing new heights of accomplishments is the fatuously grand delusion of contemporary dentists. Materials, contrivances, instruments, and other such apparatuses do not create dental art or beauty . . . visionary dentists do! Thunder is impressive, but it is lightning that does the work. Mozart was never heard to have complained that he did not have a Steinway. The work of creation is never without travail. I know of no simple and painless process for giving birth to excellence no matter what the area of human endeavor may be. If we can not learn to do things well, we ought not to learn to enjoy doing those things badly. Through perseverance, imagery, and creativity, the true a aesthetician brings something new into the world that did not exist before, and he does it without destroying something else. The power of thought, the magic of the mind's imagery, cognitively directs the hand to skillfully create our restorations, something that no machine will ever be able to replicate. Excellence and creativity are not isolated acts but rather habits of inspirational visualization prior to fastidious technical performance. Dostoevsky has said, "No man or nation can exist without a sublime ideal." As dentists, our "sublime ideal" is our innate ability to successfully conceptualize, visualize, and then creatively perform excellent clinical dentistry (**Figure 5**). It is our collective manifest imperative. To that ideal, mental imagery is indeed the irrefutable key to dental artistry.

Men who are occupied in the restoration of health of other men, by the joint exertion of skill and humanity, are above all the great of the earth. They even partake of divinity, since to preserve and renew is almost as noble as to create.
Voltaire

Reprint requests: Harold M. Shavell, DDS, 1341 Wessling Drive, Northbrook, IL 60062-4228, USA; Tel.: 847-498-2929; email: poppinanna26@gmail.com

 DOI 10.1111/jerd.12009