

THE THERAPEUTIC EFFECT OF HIGH-FREQUENCY AUDITION AND ITS ROLE IN SACRED MUSIC

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The following chapter is an updated version of a scientific article written in 1986:

The Therapeutic Aspect of Sacred Music

Forward:

“Every sickness is a musical problem.

The healing, therefore, is a musical resolution.

The shorter the resolution,

The greater is the musical talent of the doctor.”

Novalis

Before the physician in me leads you through research in high-frequency audition, the musician within wants to share his personal experiences with sound. I am writing both as a physician and a musician since a common ground is only now being established between these two healing modalities. In medicine, we often speak of its artistic and its scientific nature. Thus the Art of Medicine and the Science of Medicine are both acknowledged. However, this dichotomy between science and art, or rather between qualifiable and quantifiable knowledge, is an artifact of poor perception. Everything that is real, either in the world or in people’s minds, has both a quality and a quantity.

Take Time, for example. The time it takes for a day to elapse can be described as 24 hours, 1440 minutes or 86,400 seconds depending on one’s need. What could be more quantifiable? The qualitative aspect of Time however is just as reliable and predictable, albeit less understood. We know (and this is where physicians and scientists have to stretch a bit) that the location of the planets at the time of one’s birth qualify one’s character. Many wives are cautioned, “You’ll just have to put up with that. He’s an Aquarian.” Or consider the words which strike insecurity in the hearts of all working parents, “quality time.”

When people talk about the art in addition to the science of medicine, it is because they somehow recognize this to be appropriate for an activity where mortals toil at the threshold of the spiritual world. Science alone is too impotent in an environment where lives are lost on a daily basis. We must call Art, with all her intangibilities and mysterious powers, to our succor. Unfortunately, few people are talking about the science of music therapy. Instead, they delegate it to the qualifiable domain of art alone. However, there is a nascent science to music therapy. Indications along those lines will form the core of this paper.

Accordingly, I write for scientists and non-scientists. Both will have to stretch a bit to meet me on the bridge of ideas. Non-physicians might have to consult some medical texts, but where can scientists turn when ideas like “soul,” “spirit” or any qualifiable entity are discussed? Believe me, it can be every bit as tough a stretch for a physician or scientist to read about qualities as it is for a non-scientist to read about quantities. The language of feeling and personal experience can be as intimidating to my professional colleagues as Latin or Greek medical language can be to patients. So, I write as both a physician and scientist and as musician to the scientific and musical side of all my readers.

I was fortunate. My mother sang to me as a child. She also played music for me and even encouraged me to sing along (a supreme act of love!). I was comforted by the rhythm, the sounds and the familiarity of songs. They lulled me calmly to sleep at night, provided the entertainment now sadly offered to kids by television and guided me gently through many childhood traumas. Music was a comfort, a reliable support for me. Through most of childhood, like a guardian angel, I had Music on my side.

Then, sometime around fourth grade I suffered an injustice as tragic as it is universal. Gamely trying to sing in the school glee club, I was singled out by the choir master and informed in front of the entire group that, for the sake of the upcoming Christmas performance, I must stand in the back row, mouth the word “watermelon” and make no sound. Apparently he needed my body to fill space but had decided he could do without the voice and the soul that came with the body. As I think back on that psychic trauma decades ago, the most remarkable point is how willingly I accepted this judgment. I can’t quite remember, but I suppose I did as I was told. Perhaps I sang very quietly at some points in the performance, but probably I was a good boy and spent the two hours mouthing the word “watermelon.”

How strange that so many of us stopped singing in childhood because of similar criticism. Why did we believe our respective choir masters (or whoever it was that stopped our song) when they told us we should not sing out loud? One woman was told not to sing by her mother, another by her boyfriend. One elderly man, finally learning to sing at seventy-five was asked by a minister to never to sing out loud in church. We all know friends who today refuse to sing along years after being told they have a bad voice. Why does not our humanity rear up and defend its birthright to sing and dance and be joyful before our Maker and our loved ones? Why do we so easily stuff our voice, the herald of the soul?

Long before I thought of becoming a physician, the professional warned by Hippocrates to “*heal thyself,*” I did just that by instinctively finding a way to resurrect my voice. Perhaps I couldn’t have done it without the generous foundation laid by my musical parents, but in the summer of my sixteenth year, I taught myself how to sing. I had fallen into an intimate relationship with a two hundred year old pine tree that enjoyed the winds and weather halfway up a mountain behind our house. I would meander up that mountainside, climb high up into her branches and listen to the wind strum her needles. Way above the houses and buffered by miles of thin air from the music critics below, I gradually found my voice. Free from embarrassment, I learned to sing wildly to the world from the treetop stage as the inhibitions that were choking my voice loosed their grasp. I learned to sing to my heart’s content. In doing so, I feel I reclaimed an essential part of my humanity. This tryst lasted but a few summer months; certainly that ancient pine has proven to be the most influential summer love I have ever known. Since then, those who know music say I have a superb (albeit unschooled) tenor voice. “Didn’t you ever sing in a choir?” they ask....

I am no different from you. Unless you have had throat surgery or ear trauma, that is, assuming no anatomical handicaps, I know that you too have a superb voice stuffed somewhere between your soul and your lips. Yes, you! I know this because I have helped introduce many incredulous people to their

long lost voices. Talk about joyous reunions. Quite frankly, I know of no medical accomplishment that can compare with the gratification I feel after helping people listen for their voices and then sing along with themselves (and eventually others).

A brief word about technique (this is the self-help part). Consider the wisdom of the bumper sticker I saw on a Los Angeles freeway that said, "Get out of your own way". (If I had been a more capable driver that day and had been able to maneuver through that traffic, I would have followed that driver home and sat at his or her feet to seek enlightenment). So it is with singing; we must get out of our own way. Music is what the human frame and soul is designed to do; we need simply to learn to allow song to have its way with us. Next, we need to attend to breathing. The physics of voice involve air being forced past vocal chords which vibrate, thus making sound. The bellows must deliver an even and ample source of air in order to generate a pleasant voice. In Aikido and most of the traditional martial arts we are taught, "If you can control your opponent's breathing by making him breathe at your rate and depth, you have the critical advantage". So it is with song: if the singer within can encourage the criticized child within to breathe regularly and "soundly" then, quite naturally, the body does what it has craved all along, it sings! Later, fine tuning involves the art of listening (see below), for the best singers sing mostly with their ears.

Before we get into the merits of music therapy as a bona fide entree at the smorgasbord of health care, let me share some arguments for music's place in an educational curriculum. It's presence in the classic Greeks curriculum alone doesn't persuade, since they also encouraged naked wrestling! Or consider that the Swiss hold music in such high regard that part of a primary school teacher's certification hinges on the ability to carry a tune so as to prevent affronts to young ears (and presumably souls). So why might music be deemed essential in the USA's 20th/21st century curriculum? Because it is the premiere training for teamwork and cooperation. Traditionally America's finest schools have left the teaching of teamwork and cooperation to physical educators and more specifically, football coaches. The belief was that team sports teach teamwork however, speaking as a varsity athlete in four sports (including football), I can say that "it just ain't so." Orchestra- That is the best training ground for teamwork. A running back can be a star despite poor blocking and carry a football team on his back. A topnotch violinist can't do the same with a school orchestra. It's the nature of the endeavor. Group musical activities depend on the group. It's all for one and one for all. The orchestra sinks or swims TOGETHER. The members listen carefully and caringly (and sometimes critically – but for their own sake-always constructively) to less talented or disciplined members. They are the best example of a team effort. Those who value new games with the "I win you win" vs. competition philosophy or who value cooperation with other nations in building world peace would do well to beef up the music department of their local school.

After music and I became reacquainted and formed a happy partnership, I continued to discover how essential its presence is to health. For sheer power, magnificent in its splendor, observe what music does with the vitality and happiness of handicapped children. For a brief, thrilling period of my life I was charged with doing music therapy with severely physically and mentally handicapped children in a West German school. Seeing the richness of emotional experience in a child whose crippled hand I guided across a cello's strings was as intoxicating as it was awe-inspiring. The empowerment these mangled children seemed to attain by initiating, being able to sustain and then, whenever they choose, to arrest a tone from string, wind, percussion or vocal instruments was profound.

Different instruments seemed to have different effects first the children's' mood, and later on their personalities. I began to consider prescribing different sounds as a doctor would specific medicines. Quickly, however, I found that these kids knew best which instruments they needed to nourish depleted aspects of their souls or personalities. Intuitively, they sought out the right energy; one day

the soothing cello vibrations, one day the bleat of a poorly played horn, next the crash of a drum, then back to the string instruments.

My interactions with them were blinding, as when one stumbles out of a dark room into daylight. In this case, the intensity of their relationship with music made other aspects of my life pale by comparison. The eyes of my soul were not accustomed to the brilliant power of music as therapy. I had taken the job thinking it would be fun; it would provide a distraction from their handicaps, a form of amusement. I did not realize how profound a source of nutrition and therapy the sounds would be for these handicapped children.

When I finally perceived what powerful therapy was happening around music, I felt a bit the intruder, somewhat unworthy to be witnessing such pure therapeutic power. I felt, as must have Phaeton, the son of Apollo, who took Helios's sun chariot for the ultimate joy ride. Put yourself in the chariot as the wild horses surged across the sky pulling the mighty sun behind their thundering wings. Imagine the exhilaration young Phaeton felt riding that sun chariot. That is the feeling the music therapist feels in discovering and riding along with the extraordinary therapeutic power of sound. Phaeton's ride ended in tragedy when the steeds, sensing an unfamiliar hand on their reins, flew too near the earth. To save the parched earth from catching fire, Jupiter destroyed them with a thunderbolt. The power of music in therapy is far more forgiving. I know of no toxic side effects from music therapy save unnecessary ear trauma related to excessive volume.

Working with those crippled children who grasped passionately for their musical birthright taught me to respect the power of music therapy. My belief in music therapy has been repeatedly reinforced in a myriad of ways as varied as the suffering people bring to my practice. Novalis, the German poet, wrote:

“Every sickness is a musical problem. The healing, therefore, is a musical resolution. The shorter the resolution, the greater the musical talent of the doctor.”

I think I understand what he recognized. One can never be certain with poets, but I think I have seen it too. And so I have come to believe that the part of us that sings is quite closely related, if not identical, to the part of us that grows and heals. The vitality released when the adult patient rediscovers his or her abandoned child-voice is miraculous to behold. It makes the practice of medicine rewarding and fun. Novalis wouldn't be surprised to learn that the medical literature is completely unambiguous in finding fewer intra- and post-operative problems with patients whose surgeons talked with them prior to the operation. He would perhaps wonder, as do I, how much better the operative results would be if surgeons sang with patients prior to their surgery!

When studying human anatomy and the intricacies of biochemistry in medical school, I discovered that background music of Gregorian and Tibetan chants facilitated my memorization ability. Once again, Music revealed another aspect of her power to me. It was this experience of music somehow seeming to enhance my concentration ability which led me to the study of the therapeutic aspect of sacred music. That study is described below.

The Therapeutic Aspect of Sacred Music

ABSTRACT:

“He that hath ears to hear, let him hear.”

Matthew 11:15

This report presents a reinterpretation of the currently accepted theories of human audition. The anatomic structure and the neuro-physiologic function of the human ear are re-examined. A discussion of the theoretical underpinnings of an intriguing form of sound therapy, filtered high-frequency audition, is presented. The therapy itself is described as well as the patient population, which has benefited from this innovative approach over the past two decades. Finally, the practice of chanting in two quite distinct cultures (Christian Gregorian and Tibetan Buddhist overtone chanting) is considered in the context of health maintenance.

INTRODUCTION:

“In all matters of opinion, our adversaries are deranged”

Mark Twain

Through evaluating the controversies which rage within the field of neuro-audiology, it became quite clear that, in times of intellectual upheaval when one theory is attacked by another, qualities of courage and fidelity to scientific methodology are absolutely essential. Courage may be derived from a love of truth. Fidelity involves the ceaseless effort to concentrate, without bias or preconceptions, on the phenomenon itself. To perceive an object, without being waylaid into perception of one's concept thereof, is a profoundly challenging task. It is the keystone of a sound scientific edifice.

Therefore, when presented with interpretations which seemed far-fetched, it was an exercise in tolerance to reserve judgment until the case had been made in its entirety. An attitude of “reserve and observe” had to be cultivated. Only then, I found, can the data be appreciated from a new and exciting light. Children of convenience, we are often placated by the original interpretation of data and there it may sit atop its laurels, an incumbent theory, defying reinterpretation despite the advance of technology. In time, most theories yield to reformulation due to their inherent weaknesses in the face of persistent complexities. Few theories fit perfectly. However, this is never a peaceful process.

This report demands the same intellectual patience from the reader. Don't say “No!” say “Oh...” until one is sure that perceptions of objects (in this case the human ear and audition), and not our conceptions thereof, are at the base of one's assessment. The radical reinterpretation of current thinking about the ear which is described below first caught my attention because of its clinical applicability as therapy. That, as well as its theoretical elegance, was what originally caught my attention. The characters involved in this report are varied. (See appendix). The cast includes otorhinolaryngologists, neurologists, audiologists, Tibetan and Christian monks, extraordinarily varied patient populations, and, of course, the sources of original interpretations, those investigators, without whose shoulders, reinterpretations would not be possible.

ORGANIZATION AND METHODOLOGY:

“Irregularity and want of method are supported only in men of great genius.”

Addison

This study was organized into four distinct phases:

Phase 1 involved a survey of the literature regarding the ear and audition. This survey was necessary in order to lay a theoretical foundation upon which controversial reinterpretations made by individual medical doctors, technicians, and patients targeted in the study could be evaluated. This preparatory

phase enabled subsequent discussions to transpire regarding unorthodox theoretical and therapeutic aspects of their work. What are the bases of their ideas? How do they measure their results?

Phase 2 involved working with Dr. A.A. Tomatis, the French oto-rhino-laryngologist who, since 1940, has broken new ENT ground and created the field of audio-psycho-phonology. I spent a week with Dr. Tomatis discussing his theories and observing their therapeutic applications in his clinic, the Tomatis Centre in Paris. In addition, I interviewed patients, technicians and staff at this, the flagship center of the 45 Tomatis Centers world-wide.

Phase 3 involved immersing myself for entire days in the sacred rituals and acoustic environment of a handful of Christian and Buddhist monasteries in France and India which maintained the traditional form of the Gregorian chant and the Tibetan overtone chant. Additionally, I interviewed chant masters, abbots and monastic health care providers in order to determine the effect which factors such as lifestyle, attitudes and beliefs have on the well-being of the monks. An effort was made to distinguish these factors from those of the chant.

Phase 4 of the study involved, upon returning to America and in association with my advisors, consideration of the information collected over these two months. Not surprisingly, this phase proved to be the most challenging part of this study. Attempting to interface between such cantankerous siblings of human thought as religion and science in terms of medicine left me with far more questions than it did answers. ([It did lead to this poem](#) which I wrote in my second year of medical school).

The methodology of Phase 2 and 3 of the study was to gather anecdotal information from interviews with individuals involved with auditory therapy (medical doctors, technicians, patients) as well as practitioners of traditional chant (monks) and their health care providers. Recordings were made of the chants and high-frequency therapeutic tapes using an Aiwa Stereo Radio Cassette Recorder J02 Model No. HS-J02, a Sony ECM-939LT Electret Condenser Microphone and TDK nl bias 120msEQ acoustic dynamic cassette tapes. Photographs of therapeutic and religious settings were taken where discretion permitted.

PHASE 1: THE ROLE OF THE HUMAN EAR

“A man clings all his days to what he received in his youth.”

Paracelsus

Literature Summary:

Searching the literature, and taking degree of disagreement among specialists as my barometer, it quickly became apparent that the ear is a much studied, yet incompletely understood organ. What follows is a summary of the orthodox views regarding anatomy, neurophysiology and therapeutic potential of the ear. This information was gathered from my medical school basic science curriculum, a literature search and interviews with specialists in the field.

The human ear has two important functions: hearing with the cochlea and balance with the vestibule. The ear is routinely given short shrift in gross anatomy classes where its tiny intrinsic muscles such as the tensor tympani or the stapedius are rarely seen. In anatomy textbooks, the eighth cranial nerve, the acoustic nerve, routinely gets the least print.

Theoretically, the structural relationship and function of the ossicles involves sound, in the form of vibrational energy, which transverses the ossicles from tympanic membrane to oval window. The ossicles are, in order, the hammer (malleus), the anvil (incus) and the stirrup (stapes). The clinical significance of Rinne's and Webber's signs are presented as determinations of air and bone vibrations conducted to the oval window – the former by the ossicles, the later by the larger skull bones. Additionally, theory has it that this vibration is transmitted through endolymph in the superior segment of the spiraling cochlea (the vestibular ramp) up past high, middle and low frequency receptors (cells of Corti) to the apex of the spiral cupula before descending finally via the inferior segment of the cochlea (tympanic ramp) to the round window.

Among the orthodoxy, the only questions remaining are those regarding the processes which transform vibrational wave energy to electrical energy at the cells of Corti and ultimately to cognitive perception of recognizable sounds at the level of the cortex. Regarding therapeutic approaches to hearing loss, the hearing aid [1], and a cochlear implant which electronically facilitates hearing [2] were described. This sums up the orthodox view of the ear as of the completion of Phase 1 of my study in June, 1986.

Comparison of Orthodox and Unorthodox Views:

1) Regarding the Embryological Origin of the Human Ear:

“If you want to understand what something is, you must look to see where it came from.”

Goethe

Orthodox: It is commonly understood that the ear is divided into three parts – the external ear (meatus and canal), the middle ear (tympanic membrane, ossicles, middle ear muscles) and the inner ear (vestibule and cochlea).

Unorthodox: An appreciation of embryology suggests that there are, practically speaking, only two ears – an external and an internal ear. We know that the embryo originally consists of a series of five branchial arches [3]. The adult ear develops from the first two. More specifically, the first brachial arch will develop into the first two ossicles of the ear (the malleus with its muscle and the incus) and falls under the enervation of the trigeminal nerve (5th cranial nerve). The second brachial arch produces the third ossicle (stapes with its stapedius muscle) and is innervated by the facial nerve (7th cranial nerve). More can be made of the other organs which arise from these first two brachial arches (lower jaw with adductive muscles from the first and upper part of the larynx, the hyoid bone and the anterior ventral segment of the digastric muscle with opposes the jaw adductors) but references must suffice for interested readers [4]. My point here is that the ear is functionally understood as tripartite while actually comprising a polarity. This distinction becomes therapeutically significant in terms of high-frequency audition. (see following)

2) Sound transmission:

“We really ought to know by now how the ear works.”

Ashmore in Nature 8/84

Orthodox: The commonly accepted role of the external canal as regarding sound transmission is considered to be a low-frequency filter. It is observed that bone vibrations of the skull can create sound waves in the external canal which excite the tympanic membrane [5]. The role of the ossicles is

commonly understood as transmission linking sound vibrations at the tympanic membrane to the oval window [6]. The role of the middle ear muscles, the tensor tympani and the stapedius, according to von Békésy, is to maintain the connection between ossicles. This long-standing interpretation is currently being challenged by Howell. The role of the endolymph is to further conduct the wave of kinetic energy towards its destination, the cells of Corti. The tectorial membrane's role is to anchor the hairs of the cells of Corti in order to facilitate the shearing force necessary to set up an active potential which will propagate along the eighth cranial nerve to the cortex for cognitive processing. The role of the cochlea is to contain the fluid and its kinetic force thus preserving the sound fidelity. The role of the round window is to dampen kinetic energy [7]

Unorthodox [4]:

A) The distance separating the incus and the stapes, sometimes up to 1 mm, and bridged by collagen, cannot conduct sound with fidelity commensurate with human hearing. To assume that high frequencies can be transmitted intact through this distance and medium seems unreasonable rather than transmitting vibratory energy from external to internal ear, the function of the ossicles is to dampen tympanic membrane vibratory energy via a kinetic negative feedback loop originating at hyperkinetic endolymph. This fluid force is transmitted to the base of the stapes then to the incus and finally to the malleus in order to diminish vibratory sensation headed to the ear. In effect, rather than transmitting sound, the ossicles serve a protective role by dampening excessive vibratory energy transmitted to compact bone at the tympanic sulcus. (Although the first, Tomatis is no longer alone in assigning a protective role to the middle ear. (Simmons 1964).

B) Endolymph is always moving [8]. Therefore, to consider that it can carry specific waves amidst the turbulence seems unreasonable. Additionally, the observation that sequential sounds can be transmitted almost instantaneously is inconsistent with the assertion that the sound is transmitted through the fluid [9]. The function of the endolymph as regards hearing is to buffer the shearing potential of the vibrational force. Here in the ear, as in other parts of the body (joints, brain vault), fluid does what fluid does best: its role as endolymph is to absorb kinetic energy and protect contingent structures from damage.

C) Removal of the ossicles in no way diminishes osseous conduction [5]. However, removal of the ossicles would result in a relatively flaccid contact between the tympanic membrane and the tympanic sulcus thereby accounting for the observed loss of 60db in air conduction.

D) Tomatis claims that osseous conduction (a highly controversial field at this time) is the major route of sound conduction to the inner ear. The route is as follows: air vibration hitting the tympanic membrane is spread outward along its radiating fibers to the tympanic sulcus where the petrous pyramid (compact bone) conducts the kinetic energy directly to the cochlea and finally to the basilar membrane [4]. A consideration of the anatomy of the tympanic membrane suggests that arciform fibers collect wave impulses and disperse them to the periphery of the membrane which is firmly attached to the sulcus. Opponents of bone conduction note that only direct contact of the vibration tuning fork to bone yields true fidelity and that the soft tissues atop the skull constitute resistance [5]. In light of that observation, it is interesting to note that the tympanic sulcus is the location where bone receives vibrational energy most directly. Furthermore, the endochondral capsule is the only place in the human body where primitive bone which developed from fetal cartilage persists unchanged (no resorption) from before birth until after death. Thus, this static medium is the ideal conductor for vibratory energy. (Whales hear via osseous conduction). The oval and round windows, like the eustachian tube, function as additional buffers against the shearing force requisite in audition. To function optimally, the human ear must maintain a micro-homeostasis which allows for maximal sensory perception with minimal shearing and destruction of hair cells. The role of the

middle ear then is to guard the sensitive cells of Corti which are responsible for energy transduction within the inner ear.

E) Flock was not the first to observe that the basilar membrane vibrates. However, he was the first to announce the disruptive observation that hair cells, the organs of Corti, contain actin and a variety of protein associated with contractility [10]. Consequently, the suggestion arises that the cells of Corti are end organs rather than sensory cells imply that they play a role in cochlear mechanics. Therefore, where once we thought that the endolymph vibrates the basilar membrane, we now have data calling that into question. It remains solely a matter of interpretation as to whether the endolymphatic eddy is the cause of, or, as Tomatis suggests [4], the result of the resonating membrane.

F) The tiny stapedius muscle, which controls the stapes and thereby regulates high-frequency audition, is the only muscle of the human body which never rests [4]. Even the heart pulsates, a motion which involves periodicity and therefore a rest of sorts. The stapedius, however, is constantly involved in regulating sound perception from the fourth month post-conception until the moment of death [11]. This constancy has significance as regards cortical charge (cf cortical charge).

3) Ear Neurology:

“The Nerves of the Terrible Pterygopalatine Traffic Circle” every anatomy student’s nightmare

The ear is the Rome of the body. As a student of gross anatomy, it struck me that almost all cranial nerves lead to the ear. Whether directly or anastomatically, the ear is involved with cranial nerves 2-11. The 5th and 7th cranial nerves innervate the ossicular muscles. But, in order to fully appreciate the extra-auditory and extra-gyratory role of the acoustic or eighth cranial nerve, we must understand the oculo-cephalo-gyre crossover which, in mammals showing a high degree of cortical sophistication, is apparently under the control of the visual function [4]. It is customary when dealing with cortical functions to link eye, head and neck mobility with the optic nerve. However, the coordinated interplay of these functional structures is under the control of the acoustic nerve. This structure, appropriately called the audio-opto-oculo-cephalo-gyro cross-over is the major mechanism of reception and integration of perception. Therefore, the ear is now understood to be neurologically involved with the optic or 2nd cranial nerve, the oculomotor or 3rd cranial nerve, the trochlear or 4th cranial nerve, the abducens or 6th cranial nerve and the spinal-accessory or 11th cranial nerve which is responsible for posterior-lateral musculature of the neck.

Not satisfied with this scope of neurological involvement, the ear has a fascinating tie into the 10th cranial nerve or the vagus, “path of the wandering soul.” What has the vagus to do with the ear? For those of us who think of the tympanic membrane solely as a receiver for sound waves, it is instructive to recollect that a solitary cutaneous sensory antenna from the vagus presents on its outer surface and that its inner surface is sensitized by the vagus via an anastomosis with the glosso-pharyngeal or 9th cranial nerve. What is the significance of vagal and acoustic interaction? Let us track this path throughout the body. The vagus wanders on contacting next the postural back muscles via an anastomosis with the spino-accessory or 11th cranial nerve, then sensitizes that part of the larynx responsible for vocalization via the upper laryngeal nerve before delivering motor innervation via the recurrent laryngeal nerves. Subsequently, the vagus innervates the bronchi and heart before joining the opposing vagal nerve and diving through the diaphragm to innervate the entire viscera including the gastro-intestinal tract from esophagus to anus (via anastomosis with sacral nerves 2, 3, and 4).

The effect which audition has via the vagus is substantial. Prasad observed cardiac depression upon syringing the ear [12]. But this ought not surprise us. What would a scary movie be without the emotionally manipulative sound track? Think of the effect which a patient in the process of vomiting

has on our own intestinal homeostasis. It is empathy, or perhaps direct vagal stimulation from our tympanic membrane to our gastrointestinal track which evokes our similar contraction. As the ear becomes appreciated as our primary sensory organ (for both internal and external phenomenon) as well as a vagally mediated internal moderator via its extensive anastomotic innervations, a theoretical basis for audio-therapy comes into focus.

This is only a glimpse of some major reinterpretations of ear structure and function. The bibliography offers the reader opportunity to pursue these and other equally off-putting assertions in greater detail than the scope of this report justifies.

To summarize, Phase 1 involved gaining an appreciation of current controversies in the field of aural neurophysiology in order to assess related therapeutic modalities. The value of Phase 1 lay not in taking sides, but in meeting the challenge of trying to comprehend both sides of a controversy. This approach proved to be an excellent method for gaining a solid understanding of the field. Furthermore, I did learn to distinguish between presentation of observations accompanied by interpretations therefore, and the presentation of observations themselves as fact.

PHASE 2: THE WORK OF DR. ALFRED A TOMATIS

“Creative imagination is frequently associated with the interplay between two conceptual frameworks.”

Koestler

Phase 2 of this study involved working with Dr. Alfred A. Tomatis in Paris at one of his 45 therapeutic centers worldwide. Born in 1920, Dr. Tomatis earned his M.D. from the Faculte de Paris before specializing in oto-rhino-laryngology. En route to establishing the International Association of audio-Psycho-Phonology, Dr. Tomatis was distinguished as follows: Chevalier de la Sante Publique (Knight of Public Health) 1951; Medaille d’Or de la Recherche Scientifique (Gold Medal for Scientific Research) 1958; Grande Medaille de Vermeil de la Ville de Paris 1962; Prix Clemence Isaure 1967, Medaille d’Or de la Societe Arts, Science et Lettres 1968; et Commandeur de Merite Culturel et Artistique 1970.

As a scientist, Tomatis is well recognized for his experimental breakthroughs in the field of auditory neurophysiology. For example, while treating hearing impaired factory workers by day, and scotoma-cursed opera singers by night, Tomatis noticed a similarity of symptoms between the two patient populations. After further investigation, he formulated the law describing the feedback loop between the larynx and the ear: “the larynx emits only the range that the ear controlled.” In other words, one can reproduce vocally only those sounds which one can hear. This discovery was recognized by the Academy of Sciences of Paris and the French Academy of Medicine who, in 1957, announced the Tomatis Effect in honor of its discoverer.

As a clinician, Tomatis has achieved the reputation for successful and unorthodox therapies whose scope exceeded the scope of oto-rhino-laryngology. The list of maladies successfully treated via high-frequency auditive therapy includes: Ear, Nose and Throat disorders: (hearing and voice loss [13], stuttering [14], tinnitus [15], otitis media [15], scotomas [16, 17]); Neurological disorders: (toe walking from vestibular nuclei problems [18], drooling [15, 19], strabismus [15]); Psychiatric disorders: (depression [20], attention deficit disorder [21], hyperactivity [21]); and Learning disorders: (dyslexia [22], inability to concentrate [15]); and a variety of balance/coordination problems related to the ear’s vestibular disorders [15]. These therapeutic coups occur via retraining the ear muscles using another Tomatis invention, the electronic ear (see below). These claims regarding the therapeutic efficacy of

filtered sound was what drew me to France. What follows will be a brief description of the theoretical bases and practical applications of Tomatis's therapeutic work.

Electric Ear and Middle Ear Micro-gymnastics:

"This machine trains athletes of the middle ear –it produces champion listeners."

A.A. Tomatis, M.D.

Theory: Most of us have fiddled with the bass/treble knob on a stereo set. What we probably did not recognize, however, was that it was easier to hear the bass sounds than it was the treble ones. (Bass being closer to touch on the continuum of sensible vibratory energy, that is, hearing as tactile reception is a form of touch). This difference in relative ease of listening became the crux of Dr. Tomatis's electronic ear.

The electronic ear is defined by Lafon as "A machine comprising microphone, amplifiers, filters and earphones, used for remedial phonation and dyslexia therapy. With a microphone attachment, it can be used for language teaching." [23] This machine is designed to help the ear acquire three functions: listening, monitoring of language and laterality.

The electronic ear works by delivering to the listener's ear a course of sound which is progressively filtered along a continuum from normal non-filtered sound to sound where all save frequencies greater than 8000 hz have been filtered away. In addition, the sound delivered to the patient alternates between two channels which are set at maximum bass and maximum treble. Consequently, the stapedius muscle must control the stapes in order to listen to ascending high-frequency sounds as well as accommodate the fluctuations between bass and treble at the given frequency. This challenge to the atrophied middle ear muscles (especially the stapedius muscle of the stapes which is primarily responsible for high-frequency discrimination) constitutes the micro-gymnastics, which orchestrate the reattainment of physiologic listening or focusing function of the ear.

Application: Auditory disorders are easily identified by noticing aberrations from normal listening posture (note monastic posture of head inclined at 30 degrees which levels the horizontal semi-circular canal), atonality or lifeless speech, poor body tonus, substandard motor coordination, facial dyskinesias and lateralization to the left (talking out of left side of mouth). Predictors of auditory disorders involving high frequencies would include dyslexics, stutterers (i.e. a variety of learning disabled people) as well as products of traumatic births (caesarian sections, premature, forceps-damaged, and anoxic as well as occasional twin births) [24].

The Tomatis test is another critical diagnostic tool. This procedure tests for threshold evaluation at a predetermined intensity for frequencies ranging from 125 to 8000 hz. Both air conduction and bone conduction (at the mastoid) curves are ascertained. The test also determines the patient's ability to recognize pitch differences in closely related sounds, the dynamic tonal differentiation, which is also a form of auditory discrimination. Finally, spatialization and laterality are tested.

Tomatis is given credit for being the first to appreciate the important neuro-physiological distinction between hearing and listening. The former is non-selective, whereas the latter is a focusing of the ears and an attending to one of the many sounds that are heard simultaneously. Hearing is less strenuous than listening, which involves will power. Tomatis's listening test differs from the audiogram of the audiologist in that the listening test is concerned not only with organic capacities of the ear, but also with the degree to which the ear's potential is being utilized by the patient. An audiologist will frustratingly acknowledge that many people that come to them with hearing problems who, according

to their audiograms, can hear perfectly well. In fact, their problem is not with hearing, but with listening. A course of therapy with the electric ear has been shown to improve these listening problems as measured by reattainment of optimum air and bone conduction curves on a standard audiogram.

Equally exciting is the ability of geriatric patients with high-frequency hearing loss to attain partial or complete recovery of their optimum audiometric curves. In fact, Tomatis has demonstrated therapeutic successes in all types of hearing loss cases save sensorineural loss as measured by standard audiographic analysis.

Laterality:

“My left hand hath laid the foundations of the earth and my right hand hath spanned the heavens.”

Isaiah 48:13

Theory: Who can explain the phenomenon of asymmetry in our nervous system? No one yet. Who can offer insight into its significance? Tomatis's work on laterality as a consequence of this asymmetry is compelling. Aside from the stapedial workout designed to aid the reattainment of high-frequency audition, Tomatis's electric ear trains the right ear to be the dominant or leading ear. The basis for this dextrophilia is an understanding of the asymmetrical auditory pathways [25]. According to Tomatis, the left hemisphere's speech center (Broca) is most directly connected with the right ear [4]. Furthermore, the right recurrent laryngeal nerve (connected via the right vagus to the right ear), in looping under the right subclavian artery, constitutes a significantly shorter pathway than that of the left recurrent laryngeal nerve which loops under the aorta. Consequently, significantly longer auditory feedback loop exists on the left compared to the right side of the body. Furthermore, an individual with a dominant left ear must process auditory information over a significantly longer transcerebral auditory pathways (left ear to right auditory center to left auditory center to organs of speech = 70-140 m) than is required by a right dominant listener (right ear to left auditory center to organs of speech = 30-60 cm) [15,26].

Application: The process of lateralization to the right, achieved through the delivery of sound increasingly to the right ear, has the effect of facilitating and accelerating the patient's processing of sensory and cognitive information [4].

This lateralization is an essential aspect of the therapeutic ear training which has proven valuable to the variety of patients listed above.

Sonic Rebirth and Uterine Hearing:

“... Hence, in a season of calm weather,

Through inland far we be,

Our souls have sight of that immortal sea

Which brought us hither.

Can in a moment travel thither.

And see the children sport upon the shore,

And hear the mighty waters rolling evermore”

William Wordsworth

from “Imitations of Immortality”

Theory: Perhaps Tomatis’s most provocative theory involves the idea of fetal audition [27]. Today, thirty years after Tomatis postulated this phenomenon, investigation of fetal audition is in vogue. However, despite a rash of recent studies, it remains solely a matter of speculation whether, and if so, what the fetus hears. We know that the acoustic nerve is fully myelinated and functioning at 4.5 months post-conception [15] and we also know that the fetal eustachian tube is patent thereby permitting contact to the inner ear via embryonic fluid [4]. Tomatis suggests that the fetus hears the maternal heart and respiration as well as her intestinal gurgling. This, he postulates, comprises a constant background noise. It is important as cortical charge (see below) and may be the source of our collective attraction to the sound of surf or of our inborn sense of rhythm. The fetus would hear this biological noise, but to what would it listen? What is the only sound which comes and goes at irregular intervals? The voice of the mother. According to Tomatis, only the voice of the mother can penetrate via her bones (see osseous conduction) to the intrauterine world. The child’s attention is fixed on this irregular sound which may serve as the fetus’s first target of communication. Studies show that the newborn responds preferentially to the voice of the mother [28]. Pediatricians have observed that the newborn demonstrates preference for the mother’s voice [28]. What is a reasonable explanation for this observation? Intrauterine hearing is a possibility.

Applications: The practical application of this theory are intriguing. By taking a uterine and birth history of a person with an auditory disorder, the therapist is able to predict a very curious event. Certain sound frequencies corresponding to intrauterine audition will evoke unpleasant sensations in adult listeners whose mothers experienced trauma at a certain gestational period. Additionally, a variety of neuroses are ameliorated simply by following a course called sonic rebirth. This involves, in part, the passage from audition through a simulated liquid element to audition through an atmospheric element. The mother’s voice is recorded (often reading a child’s story) and presented to the patient over a period of weeks progressively filtered from 8000 hz to 100 hz thereby simulating the auditory experience of uterine existence, labor, birth and reunion, this time via atmospheric conduction, with the maternal voice while nestled in the mother’s arms. Freud’s psychoanalytic theories and practice were once considered equally bizarre. Unlike Freud’s cases, however, the patients of Tomatis who undergo sonic rebirth are objectively evaluated both behaviorally and using audiograms which assume a motivational and cooperative component.

One fascinating spin-off of the sonic rebirth is its application in learning a foreign language. For example, a businessman who wants to learn Arabic before being transferred to that country would undergo a sonic rebirth while listening to a course of filtered Arabic. In this way, his ears are progressively sensitized to the idiosyncratic sounds of that language. Without his ears being able to distinguish particular sounds, certainly his tongue would not be able to pronounce these sounds (remember the Tomatis Effect). In this manner, Tomatis has had extraordinary success giving people a new “mother tongue” in a language of their choice [29].

Primacy of the Ear:

“The ear builds, organizes and nourishes the nervous system.”

A.A. Tomatis, M.D. [15]

Theory: Tomatis asserts that the brain receives more stimuli via the ears than from any other organ. He considers skin to be differentiated ear rather than visa versa. In his two volume work, *Towards a Human Listening*, [4], he builds an intriguing defense of this radical departure from orthodoxy which involves, for example, phylogenetic data suggesting, paradoxically, that the ear preceded the nervous system. Furthermore, an impressive case is made suggesting that our sense corpuscles (Meissners, Pacinian, Krause, Merkel's) are differentiated organs of Corti. (See Flock et al [10] re recent confusion regarding the nature of the organ of Corti). Whether one emerges from a review of Tomatis's "*Towards a Human Listening*" surprised or not, certainly one gains an appreciation of the hitherto underrated role of the ear.

Application: An understanding of the idiosyncratic physiological aspects of the human ear has important therapeutic applications. Tinnitus, for example, is a debilitating hearing disorder whose etiology is undetermined and whose treatment (masking) is inadequate [28]. Tomatis asserts that tinnitus results from a swollen inner ear artery against which sympathomimetic drugs are ineffective. This is so, he explains, because of all the arteries in the human body, this artery is not under sympathetic control [15]. Tinnitus is only one of many problematic maladies which Tomatis treats successfully using an appreciation of the peculiarities of the human ear and a course of high-frequency auditive therapy via his invention, the electronic ear.

Cortical Charge:

"There are sounds which are as good a pick-me-up as two cups of coffee."

A.A. Tomatis, M.D. [15]

Theory: The most exciting theory of Tomatis, and the one which led me to consider the role of sacred music as therapy, is the concept of cortical charge. Experience tells us that some sounds put us to sleep (lullabies) and some keep us awake (traffic); some calm us down (surf on the beach) and some make us dance all night (rhythm). A hard driving beat practically forces us to tap our feet. The screech of chalk on blackboard makes us scream and contract in discomfort. We are constantly bathed by sound and Tomatis has devoted his career to analyzing the effect which various components of sound exert on our physiology. The claim that music exerts a profound effect on us is beyond question. What remains is only to establish the correlations, perhaps psychosomatic, perhaps vagally innervated, of these sound components to our physiology. Let us listen to Dr. Tomatis directly. In a lecture before the International Kodaly Symposium in Paris, 1978, he describes cortical charge as follows:

The ear is primarily an apparatus intended to provide a cortical charge in terms of electric potential. In fact, sound is transformed into nervous influx by the ciliform cells of the cochlear-vestibular apparatus. The charge of energy obtained from the influx of nervous impulses reaches the cortex, which then distributes it throughout the body toning up the whole system and imparting greater dynamism to the human being.

All sounds cannot affect this process of charging. I pointed out that on the basilar membrane the ciliform cells of Corti are much more densely packed in the part reserved for the perception of high frequencies than in the one where the low frequencies are distributed; so that the transmission of energy that is caught up towards the cortex is much more intense when it comes from the zone of the high frequencies than when it comes from the part reserved for the low frequencies.

Thus the high sounds supply a more concentrated nervous influx and thus increase the effect of charging. This is the reason why I called the sounds rich in high harmonics the "charging sounds," in opposition to the low sounds or "dis-charging sounds." These low sounds supply insufficient energy to the cortex, which may even exhaust the

individual, so much that they conduct corporal motor responses which actually, in themselves, absorb more energy than the labyrinth can furnish. The implication of this fact at the psycho-dynamic level explains that a depressed person tends to direct his hearing more intensively towards low frequencies which are the sonic range of visceral life: she actually becomes more aware of the noise of her breathing, of her heartbeat, and so on. It seems as if her ear has lost its ability to be used as an “antenna” for communication; instead, it is directed to the inside life.

The aim will be to provoke, with sonic training made of high-frequencies heard in a listening posture, this cortical charge to energize the individual. The effect of the training generally manifest themselves in the following ways to the greater subject:

- greater motivation and competence in working
- lower susceptibility to fatigue
- awareness of dynamism
- better possibilities of attention and concentration
- better memorization

Application: Anecdotal evidence suggests that certain high-frequency sounds confer alertness and stamina to the listener thereby enhancing performance. For example, students report that listening to Gregorian chant or classical music increases their ability to concentrate. If this modus operandi sounds strange to the reader, consider the time honored prescription “whistle while you work.” Or try to imagine a military marching band without the fife. Granted the drums would discourage any waltzing by enforcing the left-right-left-right, but without the fife producing a cortical charge, how great would one’s endurance be? Bugles, bagpipes... always the high-frequency tones are found en route to battle. Perhaps these shrill high-frequency tones impart an enthusiasm via neurophysiologically mediated cortical charge.

In evaluating these reinterpretations, it is reasonable that three methodological criteria be applied: its agreement with observations, the internal relations among its concepts, and its comprehensiveness. As a second-year medical student, I must leave (for the time being) the first criterion to experts in the field whose labs or clinics offer opportunities to reproduce Tomatis’s results. Concerning the relations among theoretical concepts, consistency and coherence may be determined by the presence or absence of logical contradictions. Simplicity and elegance of a theory are desirable as well. Lastly, comprehensiveness of a theory is measured in terms of its ability to show underlying unity in formerly unrelated phenomena. Fruitfulness or Toulmin’s “deployability” in a therapeutic setting is a marker as regards Tomatis’s work.

PHASE 3 – SACRED MUSIC

Gregorian Chant:

*“Listen, my Son, to the voice of your God
and open wide the ears of your heart.”*

The first rule of the Order of St. Benoit

References are used in academic publications in order that the author's interpretation of the cited material might be substantiated by the reader. In order for the reader to gather the most benefit from the following passage regarding the physiologic effect of Gregorian chant, I refer you to any recording of this sacred music which is performed in Latin. (See the appendix for suggestions).

What is Gregorian chant? How is it different from music? Why is it sacred? or How does it promote listening? These are the questions which must be answered before descriptions of my experiences can be understood.

Gregorian chant is a body of chant collected from many cultures by St. Gregory (Pope from 590-604) in an effort to standardize the Catholic mass. Gregorian chant differs from music in a number of essential ways. Most importantly, this chant has no meter. Timing is based not on a rhythm noted on music sheets, but rather on the human breath. In fact, the chant master who trains novices (four years before they join the choir) and leads the chant, controls the group's respiration rate by drawing forth increasingly long phrases from the chanters. The extension of the controlled exhalation necessary to maintain a good tone has the physiological consequence of slowing down the rate of breathing and thereby slowing down the heart. It follows that a reduction of blood pressure occurs during the chanting. In addition, without their conscious knowledge, those listening to the monks begin to alter their breathing too. What occurs then, eight times daily for traditional Gregorian chanting monks, is a form of respiratory yoga. The result is that physical and then emotional stress evaporates permitting a profound feeling of peace to fill one's being.

Also of therapeutic interest is the practice of maintaining a certain "listening" posture during the chant. Lower back pain, stiff necks, and tension headaches are practically non-existent among these monks despite the long hours of manual labor which is required of them.

What I found to be most intriguing, however, is the fact that the traditional Gregorian chants, in combination with traditional church architecture (a paper in itself) create a sound which is rich in timberous overtones of frequencies ranging from 2000 to 4000 hz. In other words, the monks produce and listen to high-frequency sounds for eight hours every day of their lives. These monks sustain, day in and day out, a legendary work schedule. Arising at 5 a.m., and retiring by 1 a.m., the monks' day is one of work interrupted only by three hours of mealtime and eight hours of chant. On call for life. No vacations. Far from a retreat to placid contemplative existence, the monastic lifestyle is quite strenuous; many novices quit unable to sustain the perpetual demands of balancing this grueling regimen, eight hours of chant demands closer scrutiny.

Over the past three decades, many Catholic monasteries have closed down unable to sustain their operations. Tomatis claims that of these closures, none involved monasteries which practiced the traditional Gregorian chant. It is a reasonable hypothesis that cortical charge and its consequent boon to energy levels, concentration, alertness and general well being of the monks is an important factor in the health of the Catholic Church. In fact, in works citing Dr. Tomatis and his "house-calls" to failing monasteries, the Church has called for a return to the traditional, Latin form of the chant [31].

When I originally read "...open wide the ears of your heart." in the first rule of the order of St. Benoit, founder of the Gregorian chanting Benedictine Order, I thought of the heart's auricles, flaps above each atria whose function is unknown. It delighted me that indeed, the heart does have an ear, of sorts. For the moment, therefore, unsatisfied that it was so named solely due to resemblance, as the story goes, I wondered what has the heart to do with listening? In order to answer that question we must define listening. In Latin, "to listen" is translated "ab audire" which literally means "to go towards that which is heard." This, in turn, is translated in French as "obeir" which means "to obey." What then is the connection between listen and to obey? And where does the heart fit in?

It should come as no surprise to learn that each chant master whom I interviewed explained that chanting is an exercise in listening. It follows from the etymological sequence of the preceding paragraph that listening, in turn, is an exercise in obedience. At best, true listening is an approximation of selflessness whereby one person opens not only his ears, but also his heart to the words, both spoken and non-spoken, of another. Listening. The monks spend eight hours a day actively listening as they chant to their God who speaks to them through the words of the chant (psalms) as well as through their hearts – through the ears of their hearts. Gregorian chanting, therefore, to the degree that it is sacred music, is an exercise in true listening – an exercise in obedience. After all, it does no good to listen to the words of the Lord if one has not the heart to obey. (Which brings to mind the snake, a creature that is completely deaf, unless immersed in water.)

Tibetan Chant:

“The ear collects the spiraling energy from the cosmos, this energy gives life to man and we see this vitality in the light which shines forth from our eyes.”

Tibetan Medical Doctor

In 1959, seeking strategic military positions as well as natural resources, China invaded the tiny mountain nation of Tibet. One of the world's last countries whose rulers were monks, Tibet's monasteries and ancient religious culture were quickly and brutally annihilated. Today, the Dali Lama rules a government-in-exile based in Dharamsala, northern India. The world knows little about the holocaust which took place at the foot of Mt. Everest, and so, Tibetan representatives, political, religious and medical have slowly made their way to the West in order to demonstrate the importance of their cultural tradition and plead for justice before the world.

I first heard traditional Tibetan overtone chanting in 1985 when representatives of the Gyume College of Tantric Buddhism toured North America. The Gyume are part of the Galugpa Sect (Yellow Hat), a form of tantric Buddhism founded by the legendary Tsongkhapa (1357-1419). The chant did not impress me at first. Its rumbling guttural sounds, deep mutterings from the throats of monks sounded neither musical nor inviting to my ears. Not until they had almost completed the ritual did I begin to listen to and appreciate the clear overtones which soared above their fundamental chanted tones. It was then that I experienced the ancient hooni or throat singing whereby a single monk has mastered a technique enabling him to chant three notes simultaneously; one monk singing a three-note chord. This so called “one voice chording” is a sound created by a deep chanted bass note which is the fundamental upon which a note two octaves higher and a note a fifth above that are produced simultaneously. It is an ancient form of chant which is at once bewildering and hauntingly familiar to my ears.

At their refugee monastery in Dharamsala, India, I learned that the overtone chant is only performed during special occasions. These would include festivals or national emergencies requiring non-stop prayer and fasting sessions which can last up to three days. These ritual chanting marathons are an ordeal which requires mastery of the overtone technique. Without this mastery, herniations, respiratory acid-base disturbances, esophageal lacerations and a variety of traumas to the throat have occurred. Speaking technically, the goal for the monks is to make their bones sing, thus sparing their throats. A medical doctor familiar with this form of chant explained this apparently bizarre goal using the following analogy: “As the bow sets violin strings vibrating, but it is the violin body which sings, so with proper chanting posture, the larynx of the monks contacts the vertebral column thereby setting the axial bones to singing.” [15]. Theories aside, the most impressive aspect of these marathon chants is their very existence which demands incredible stamina. Additionally, the lack of trauma to the body

or throat of the master chanter suggests that the chant is in accordance rather than contrary to physiological processes.

The greatest difference between the two forms of chant is the frequency at which their fundamental tones are delivered. The Gregorian is a high-frequency tenor chant while the Tibetan is a low-frequency guttural chant. For the investigator interested in high-frequency sounds, however, it is interesting to realize the Tibetans produce a series of harmonic overtones based on a sub-harmonic “undertone” of the guttural fundamental chanted note. These overtones of under tones are audible in the same frequencies as Gregorian chants. Given that high-frequencies, in that they are more difficult to listen to than low-frequencies, train listening (and therefore, obedience), then it seems that both Gregorian and Tibetan chant are sacred sounds.

What then is the role of musical accompaniment in sacred music? Perhaps it serves as a guide for pitch, perhaps as a guide for timing. While this may be the case, let us also consider the possibility that these instruments produce high-frequency overtones which impart a cortical charge necessary to keep the participants enthused (from “en theus” or “god within”). Tibetan horns and cymbals, massive Zen gongs, Christian church organs, and steeple bells – all these instruments produce along with their deep rich fundamental notes, soaring resonant overtones – for “him that hath ears to hear.” However, while the fundamental notes are obvious (palpable even to the deaf), the overtones are discernable only to those who can truly listen; only to those who can “get out of their own way” and obey.

In summary, despite their apparent differences, both chant forms with their respective instrumental accompaniment create, for chanters and listeners alike, an acoustic environment rich in those sound frequencies which Tomatis has determined charges the cortex. Therefore, cerebral stimulation as well as a form of respiratory yoga with profound autonomic repercussions ensues. The paradoxical term “excited relaxation,” is often used to describe this post-chant state. Refreshed is what I felt.

MUSIC AS A BRIDGE BETWEEN MEDICINE AND RELIGION:

“Poetry is my way of taking life by the throat.”

Robert Frost

Sacred music, the archetypal ordering of sound, (more precisely, its domestication for human use) appears to be a form of health maintenance for monks across cultures. In singing, through alteration of breath rate, that is, through altering our body’s sense of time, we participate in something far greater than our individuality. In order to sing, we must inspire deeply, and be inspired as well. The good doctor is one who can listen deeply. Thus it is with the priest.

Music, to the degree that it is sacred, trains this listening. Sacred music, cross-culturally, has resonant high-frequencies, which demand a certain effort (compared to lower frequencies) on the part of the listener. This strenuous listening stretches the listener and, in turn, imparts a selflessness, a patience and a stillness which clears the way for true perception of phenomenon. Is that not the goal of the pure scientist, the clinical diagnostician and the theologian as well? Perception? For perception is primary. Only after clearly perceiving the phenomenon can a rational plan be formulated.

Tomatis has created an impressive therapy based on training one’s true listening. His therapy suggests that the etiology for a varied list of medical problems is, of all things, faulty hearing. For upon retraining the ears via high-frequency audition, stuttering, dyslexia, attention deficit disorders, depressions as well as a host of neurological disorders are ameliorated. Sacred chant comprises a similar high-frequency audition therapy and as such, has proven indispensable to the health

of monasteries cross-culturally. It is a simple matter to determine that the monasteries which have closed over the past century in Europe are those which determined to use their time more “productively” than chanting eight hours every day. Those monasteries which abandoned the chant as part of their daily routine are no longer operational. Thus, further study of the human ear, perhaps our primary sensory and regulatory organ, appears as intriguing as it is therapeutically promising.

SUMMARY

As a medical doctor and a musician, I have tried to write to the musician hidden within the scientists and to the scientists hidden within the music lovers. My experience with music and its curative properties involves scientific as well as personal experiences. Music therapy can be described both subjectively and objectively. Both need to be appreciated if this “fringe” therapy is to be accorded its deserved place among respected therapies.

Music therapy can be very powerful but, because we barely understand the mechanism of its action, it may be ineffectively used. What constitutes an adequate training before becoming a music therapist? What type of music is appropriate? More importantly, what type might be inappropriate and perhaps somehow damaging? (“Primum non nocere”). How to use melody, harmony, rhythm, counterpoint, frequency and tone? Should music therapists

work on souls or perhaps the mind as well? Can we get music into a patient’s blood and treat leukemia? What are the risks? In the wrong hands can music destroy health as Joshua’s trumpets made the walls of Jerico “come-a-tumblin’ down”? These questions will be answered in time. Much along these lines has already been learned and will be the subject of future books.

Let us not forget, however, that music therapy is in a long tradition of medical therapies whose mechanisms of action were not worked out prior to its widespread use. Even today, everything from aspirin to electroconvulsive therapy are commonly used without the doctor understanding how the benefit occurs. So, music therapist need not feel interlopers at the feast of medical therapies simply because their gift is poorly understood.

Perhaps, in some future neurophysiological lab or experiential workshop the mechanism will be worked out. Much work has already been done. The new field of PNI or psychoneuroimmunology (scientific talk for “holistic health”), suggests that the mind/body connection, the influence of thoughts and feelings on anatomical and physiological functions, is a real factor in healing. What had, up until a decade ago been medical heresy (i.e. thoughts influence health), is now becoming accepted by the medical and scientific profession. Perhaps the MD of the future will refer patients with infections, depression or cancer to a music therapist for specific therapeutic tonal experiences. This is currently being done in some cultures to charge chakras – an “energy center” functionally related to the immune system.

Ultimately, we all are thrown back upon our own personal experiences. Mine have been compelling. I have seen the power of music free the breath of asthmatics, curb the distractibility of attention deficit disorder children, subdue the spasm of stuttering as well as bring peace to a dying cancer patient and his suffering family.

Eventually, board certification with its double-edged sword of awarding credentials will influence who will do music therapy. Until then, the effort will be made by those of us who can listen to what resonates between the worlds of sound and substance, of spirit and matter. It will be done best by

those who understand that, truth be known, Music uses us more than we her in doing therapy. (It takes a certain type of person who is pleased be a servant of such a force in the name of healing. Most physician/scientists prefer to master, not serve forces of nature). Music therapy represents that human activity where we work closest with the angels. It demands the ability to listen; ear listening, heart listening, bone listening and blood listening. However, truly therapeutic listening requires a profound courage. The listener is vulnerable. His reality is perpetually uncertain. His gesture is one of response and accommodation rather than insistence or inflexibility. His reward is to look down on occasion from Helios's chariot upon the sunlit face of health and peace where once brooded clouds of dis-ease and turmoil. The music therapist is privileged to soar where Phaeton plummeted.

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Appendix:

List of Monasteries visited (with Hosts):

France:

L'Abbaye St. Benoit du Lac, Quebec, Canada, (Dom St. Cyr)

Tel. [819] 843-4080;

L'Abbaye Le Bec Helloin, Normandy, France, (Dom Philpbert);

L'Abbaye St. Anne de Kergonan, Brittany, France, (Don le Feuvre);

L'Abbaye St. Benoit Sur Loire, France, (Dom Jean Claude, Infermier);

L'Abbaye St. Pierre de Solesmes, Loire Valley, France, (Dom Jean Claire);

Tibetan Refugee Monasteries in India:

Namgyal Monastery, Dali Lama's Monastery (Ndgar Tobpgal);

Branch of Gyume Tantric College (Ghen Lobsang Gyatso);

Branch of Gyoto Tantric College, (Thupsten Tigme);

Tibetan Medical Information:

Namgyal L. Samden Taklha, Director, Tibetan Medical and Astrological Institute, Khara Danda Road, Dharamsala, Dist. Kangra, H.P. India;

Tenzin Choedrak, Chief Medical Officer and Personal Physician to the Dali Lama;

Yeshe Dhonden, Junior Medical Officer and Personal Physician to the Dali Lama;

Kalsang Yeshe, Council for Religious and Cultural Affairs, Dharamsala, India;

Tenzin N. Tethong, Office of Tibet, 107 E. 31st St. NYC, NY10016, Tel. [212] 213-5010;

Suggested Recordings:

Le Chant Gregorien en L'Abbaye de Kergonan, Dir. Dom Le Feuvre, Arion Records, 1980;

Chant Gregorien, Vepres du Dimanche et Complies a L'Abbaye de Solesmes, Dir. Dom Jean Claire, Glory Records, 1982;

Gyume Tantric College, Spirit Music, 42 Baker Ave., Lexington, MA 02173, [617] 861-1625, Jonathan Goldman, Pres.;

David Hykes and the Harmonic Choir, Celestial Harmonies LP;

Artists in Residence, Cathedral of St. John the Divine, NYC.

Tomatis Centers:

Le Centre Tomatis, Rue de Courcelles 68, Paris France

The Listening Center, 1170-R Yonge St., Toronto, Ontario, Canada M4W2L9, tel # [416] 922-1170;

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