The Sounds of A Cosmic Chorus

by Aaron Halevy

As we listen to the faint whispers which come to us from the shimmering aurorae and passing meteors, we reflect upon that possibility that humans can "hear" events extra-terrestrial.[1] Now we must ask ourselves, can we take any of our assumptions about hearing any further? Must we agree that the modern understanding of what "hearing" is, and what the ear's functions are, is a closed subject? And, if not, as these phenomena suggest, then what are the implications? If recording devices cannot yet record these cosmic sounds, yet living human beings can hear them, then what is possibly going on in our ears? Is sound just a frequency of vibrating airwaves? Take a more complex example: What might we actually be listening to when we hear a live string quartet or a chorus of *bel canto*-trained singers? And, inversely, what could our mp3s, and even vinyl records, not be allowing us to hear?

1. See paper on Auroral Hearing by Sky Shields, in this issue.

We have looked into the cosmos for some new clues for our senses; we've looked at the animals and their extra-powers; now let us look back, where all good scientists must look, into ourselves. A fresh study of hearing and of making music, from a standpoint less weighed down by common assumptions, could bring us closer to a freer understanding of what is actually happening in the real, unsensed universe. This investigation could bring what we call sound, nearer to the domain of light and magnetism, and reveal what a galactic impression Classical music can have.

Human Singing

U.S. researchers, in discussion with Lyndon LaRouche, by the 1980s, had possibly rediscovered the human singing voice in the realm of cosmic radiation.

More specific studies into the human voice, during the 1950s, from the communications branch of the U.S. military, and from civilian communications, like telephone companies, found some new questions from the study of what seemed to be a straightforward subject. Early on in this period, researchers in vocal physiology assumed a very simple system for the production of sound by the human voice; this model is referred to as the "linear model."

Essentially, the vocal chords produce simple acoustical soundwaves, which are then propagated in the air, which flows linearly through the throat and out of the

Helmholtz's 'Perfect' Musical Chords

Hermann Helmholtz (1821-94), a German scientist and contemporary of Bernhard Riemann, published *On the Sensations of Tone as a Physiological Basis for the Theory of Music,* in 1863. Helmholtz's view of sound and its laws, as established in this book, have become the dominant view of today's professionals in all related fields. Helmholtz arrives at the conclusion in his book, that Mozart's Trio Minuet, in the opera *Don Giovanni,* is always sung in too dissonant a manner. "The chords," Helmholtz writes, "almost always sound a little sharp or uncertain, so that they disturb a musical hearer." He suggests that perhaps performers should learn to sing in "perfect musical chords," to satisfy him.

mouth. Microphones measure the pressure of the speech signal to some accuracy. The futility of this model was admitted by some. One researcher from Bell Laboratories, about whom we will say more later, Dr. James Kaiser, said of this linear model: "It's totally irrelevant whether or not that model bears any resemblance to the physics of production. It only has to be a computationally efficient and adjustable model. That's it: computationally efficient and economically viable, so as to allow one to build the hardware to generate the speech signal as part of the system."[2] That is, those promoting the linear theory only cared about what happens outside the mouth.

Questions about what the ear hears, and what else could be going on in the voice, are irrelevant in such a model. Why? "Because," as Dr. Kaiser said, "Almost all this work on modeling was done by electrical engineers; they like to look at things as filters, as block diagrams that have 'input,' 'system,' and 'output.' The 'source,' or input is the vocal fold oscillation. The filter is represented by the cross-section area of the acoustic tube, and the 'output' is the pressure wave at the mouth. That's the filter model and its many variations. That's the approach that was used."[3] The equations were written. The models required many computers to calculate the equations, and if these models were criticized, the heartless mathematician would lurch from his table of equations to say, "These questions are not a problem, because the model works."

From this perspective, with no horizon, these researchers ran into several "anomalies." Vocal *formants*, as they are studied today, are regions in the human voice, where harmonics have stronger amplitudes. The principal vocal formants are formed at generally 500, 1,500, 2,500, 3,500 Hz, and so on. When lighter gasses are introduced to vocal production, such as helium, the calculations based on the linear model should force the pitches of all the sound, including the vocal formants to rise by a factor proportional to the difference in the velocity of the gas. Yet when the tests were done, the change was far less than expected and the irregularity was astonishing—each of the formants is unpredictably changed in different ways with the faster gas.

Other questions were raised, but were not important to explain in the linear model, such as: dealing with the surface of the vocal tract, its characteristic tissue was considered uninteresting; the lubrication essential to speaking was neither here nor there in the standard model; the similarity to speech that birds can achieve[4] was not accounted for; the changes that take place in the space of the vocal tract,[5] i.e., the tract's geometry while vocalizing, was relatively simplified in the standard theory. "Where does the voice comes from?"—although a silly question to some, anyone who sings, knows from experience, that the voice does not emanate from the throat alone. But this too is explained away as a *passive* feeling: "nothing really going on here."

Most interestingly, the energy-input measured at the glottis is only 0.1-1.0% of the energy which is measured in the acoustical soundwaves as the end result. In other words, 99-99.9% of the energy put into use when someone is speaking, or even singing, is accounted for again as *passive* resonance in the linear assumptions of the vocal apparatus.

The work to understand the vocal apparatus from what it does, and not backwards, from its assumed construction to its effects, came first from the curiosity of Dr. Herb M. Teager, a communications man who served in the U.S. Navy. Teager took the hints from some of the anomalies mentioned above, and began to play with the effects present in the voice first, without assuming what it was made of, and what it was doing.

Eventually Teager was led to investigate the voice from a totally new standpoint, as he told his colleague Dr. Kaiser, an electrical engineer and an amateur singer. "There was a lot more going on inside the vocal tract that contributes to the production of the signal outside than was included in the [accepted] models," he concluded. This led them in their work to something which would make Leonardo da Vinci smile—the investigation of fluid dynamics.[6]

Teager discovered by the use of a hot wire anemometer, an apparatus generally used by aerodynamicists to make measurements of the amplitude of the flow, that the airflow within the vocal tract varies wildly from

2. From an interview with Dr. James F. Kaiser in 1997: http://www.ieeeghn.org/wiki/index.php/Oral-History:James_Kaiser

3. Ibid.

4. Talking Myrhy Birds: 1. http://www.youtube.com/watch?v=anyBbiljocA&feature=related
or see "Einstein Bird" http://www.youtube.com/watch?v=gr2vt0CekKA&feature=related

5. See this video of human singing recorded while in an x-ray machine: http://vimeo.com/12251154

6. Leonardo da Vinci, "The voice impresses itself through the air without displacement of air, and strikes upon the objects…." (*Codex Atlanticus,* 360 r.a.).

FIGURE 1a

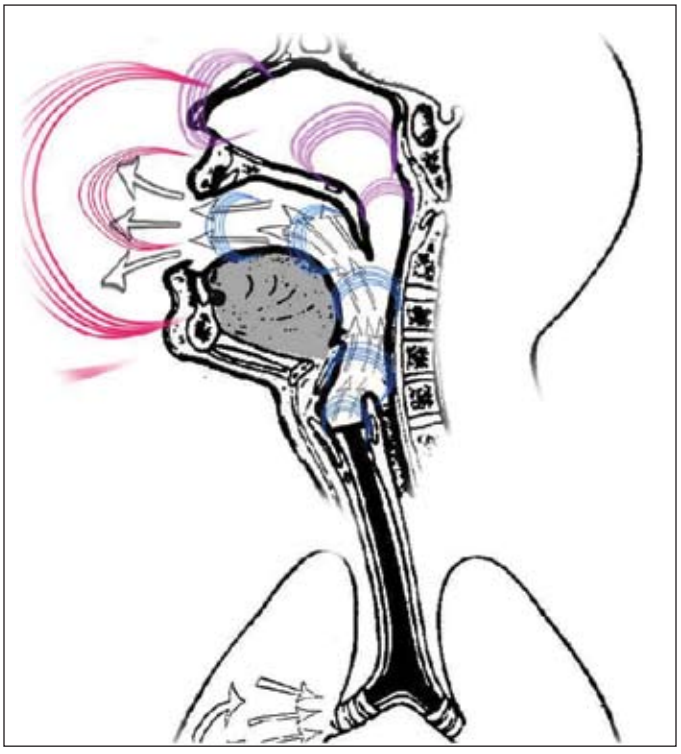
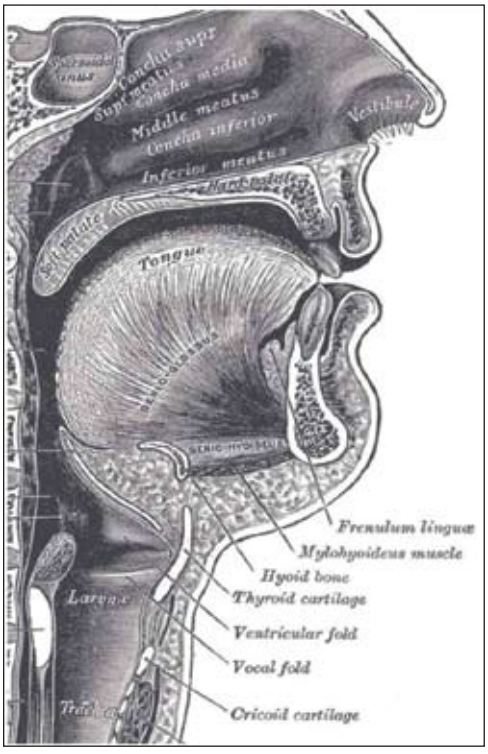


FIGURE 1b

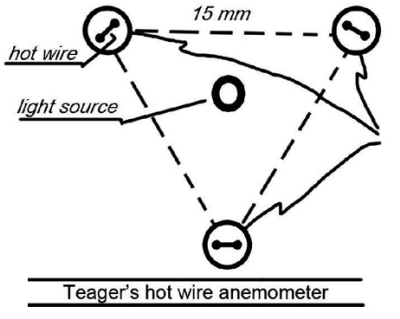


The vocal chords produce simple acoustical soundwaves, that are then propagated in the air, which flows linearly through the throat and out of the mouth.

place to place; from the beginning of the glottis, for the same vowel at the same pitch, the airflow inside the mouth was different in every location of the readings. Teager was struck by the fact that a simple, uniform airflow in the voice was impossible.

To summarize the findings, as Teager describes in his paper, "Active Fluid Dynamic Voice Production Models, or There Is a Unicorn in the Garden,"[7] after thousands of tests, and a perfection of the apparatus, he concluded that the airflow is not uniform, but is more a combination of several separate jet flows at very high speeds. These jet flows utilize the walls of the vocal tract aerodynamically to constantly create nonlinear effects by means of the high-speed pressure changes. These jet streams create a whole family of observable vortices along the walls and in the few cavities, even including toroidal-shaped vortices formed along the volume of the tract.[8]

FIGURE 2



Air passing around a wire cools it, changing its electrical resistance properties, which can be detected by the same attached wire that is electrically heating it, measuring the amount of air flow passing through the apparatus.

The action of these vortices alone is surprising, in that they are found to be pulsating in and out in phase, and modulating the formants of the voice.[9] As Teager wrote, "The pulsatile jet proceeds through the vocal tract and drives or excites everything downstream from it. If you think of it another way, what do you remember most about going over the Niagara

7. H.M. Teager & S.M. Teager, "Active Fluid Dynamic Voice Production Models, or There Is a Unicorn in the Garden," *Vocal Fold Physiology* (Denver Center for performing Arts, 1983).

8. H.M. Teager, "Evidence for Nonlinear Sound Production Mechanisms in the Vocal Tract" (1989 Presentation in France).

9. James F. Kaiser, "Some observations on vocal tract operation from a fluid flow point of view," in *Vocal Fold Physiology: Biomechanics, Acoustics, and Phonatory Control,* I.R. Titze and R.C. Scherer, eds. (Denver Center for the Performing Arts, Colo., 1983, pp. 358-386).

Falls, the froth, or the falling water? The sound generated from the second order process is the froth; the main source of energy is the glottal jet."[10] So the sound which we mostly hear is the effect which is generated by this entire process.

There was a very intense battle that Teager and Kaiser had to wage, against those who would force them to abandon their new model, and to take the advice, as it was told to Prometheus, to "kick not against the pricks." Kaiser describes Teager's frustration with the other agenda which he had to fight against in doing the research: "Look, let me get the physics right first. Then once I understand what's physically going on in this generation, then I will worry about the mathematical modeling after that, because then I will have much better guidelines as to how to do the modeling and which approximations are meaningful and which ones are not meaningful."

And so he worked, he wrote, and the papers were shot down, again and again. Kaiser: "I think he [Teager] had been beaten on so much by the establishment that he had just retreated into his little shell—or his big shell—and said to himself, 'Look, I'm going to solve this problem once and for all so completely and get so much evidence that there's no way these fellows are going to say, 'Herb, you blew it.'… He had a tremendous amount of integrity."

They both eventually left Bell Labs, and in 1989, Teager died of lung cancer.

In their view, this largely unobserved activity in the vocal tract, which makes up the very small action taking place (i.e., "fine structure"), is responsible for much of the volume of the voice, and most all of the higher frequencies, or formants. The tract itself then becomes very active, to say the least; it is not a *passive*, linear system. By this view of the vocal apparatus, the anomalies listed above can become more understandable.

For example, Kaiser, in an interview conducted in 1997, said, on the subject of the efficiency of the vocal action: "So now, let's look at this whole system from an energy point of view. For example, my speech now: I am putting maybe about a quarter of a watt into this system. Only less than one percent of that comes out as sound. So it's like I've got this tremendous reservoir of continuous energy and only a very small part of it comes out as acoustical energy. That leaves a great potential there. The opera singer stands up there on the stage at the Met singing with no microphone, with fifty or sixty pieces of orchestra in the pit, but yet that voice clearly fills that whole hall up. How do they do it with the same set of lungs and vocal chords that you and I carry around? They've learned to get that efficiency up from the order of half a percent up to seven or eight percent."

Kaiser further discusses speaking and singing in what can be seen as a negentropic process: "This is a wind-driven instrument, and the energy in this system is in the moving air. And with moving air, any time you have a time-rate-of-change of flow, you have the potential for the generation of an acoustic wave."[11]

Lyndon LaRouche, a founding member of the Fusion Energy Foundation, upon hearing of the results of this research in the mid-1980s, suggested that this evidence should lead to an electrodynamic view of the human singing voice. This discussion coincided with a strong drive within the fighting part of the scientific community at that time to promote nuclear fusion research, and the discussion was how to confine the fusion process enough to create and contain the reactions, similar to those that occur in the Sun. This, at the time, dovetailed with the work of Phillip S. Callahan on the communication of moths, which emanate a sort of double propagation: one as the "lasing" or shaping of the space, and the other as the communication (or information) wave.[12] LaRouche suggested, based on this and other evidence, some specific experiments to be conducted to extend the discussion of the singing apparatus in this regard.

LaRouche wrote, "The essential thing here, is that the *bel canto* tone is an approximation of a lased tone, as distinct from the raw tone generated in the lower portions of the human apparatus."[13] "The implication is, that the state of the macro-system in this respect, relative to the induced transparency, is more comparable to the relevant physics of propagation in water, and to certain aspects of solid state physics, than any popular, 'gas theory' notion of the air medium." He went on to define the relevant experiments to be performed to test this hypothesis: "What is implied is some form of our

10. Teager, "Evidence…" op. cit.

11. This reveals the use of microphones in more and more major opera halls across the world as a fraud similar to the stupid environmentalist's protest against the use of nuclear power.

12. by Philip Callahan, "Insects and the Battle of the Beams," (*Fusion* magazine, September-October 1985)

13. Lyndon LaRouche, unpublished memo.

dyeing of the prepared air molecules in a drift-tube-centered, ultra-quiet room sort of experimental configuration. What is suggested as instrumentation, is a combination of appropriate stroboscopic and stroboscopic-like NMR [nuclear magnetic resonance] observations. We wish to observe the condensation of the air molecules and the magnetic orientation in the cross-sectional volumes of condensation and rarefaction."[14]

Unfortunately, these tests have not yet been done, and deeper study of this phenomenon still lies beyond our grasp. The evidence already is astonishing, but much more must be done to further this work.

When thought of in the context of our more recent discussion with LaRouche on the phenomena of a space-time made of cosmic rays, one can imagine the analogy of this unseen cosmic ray space which has a mutability, which the galaxy and solar systems act on, and respond to, in their evolutionary development.

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The Italian bel canto *tenor, Luciano Pavarotti, wrote of the* passaggio *(vocal register shift), "It is a little like breaking through the sound barrier. If you do it in the right way, it affects what happens on the other side."*

Now that we have broken into the discussion of what is beyond the soundwaves themselves, what about ideas? How do ideas manifest in the voice, and then out into this space, and into the mind of the audience? What else is at play here? Is this communicated through the ears? Or can it possibly pass to your ears through your iPod?

Registration, Please…

Let us look at the human voice in practice, not as a mechanical device, but at what we need it to accomplish. This reflects Wolfgang Köhler's discussion of *isomorphism:* What is the nature of matter as it relates to cognition, and further, what is the nature of the voice that allows it to produce musical ideas—as opposed to the throat making sounds for no reason? That which is called a register shift, or *passaggio*, by singers trained in the *bel canto* method, has some very interesting implications which are worth touching upon, at least briefly, here.[15]

Kaiser, as a singer, knew intuitively that his discussion with Teager had implications which could help him in his own singing, "Certain things became much more clear to me about certain problems that I had (problems that had come up through my singing, which I was doing very actively)." Similarly, we find a functional understanding, albeit not in these terms, of the processes that Teager and Kaiser found, in some of the best teachers of *bel canto*.

The *passaggio* is described, by the best teachers, as a conscious modification of the vocal tract, by "thinking of a new shape," "shifting gears," or "going through a doorway." One can imagine that this changing of the geometry of the voice, affects all the resonances and the vortices downstream. Every voice has several such shifts. In the *bel canto* tenor or soprano, the main shift is found from the middle voice (second register) to the "head voice" (third register) and is located, at strict C=256 tuning, in the region of the F#. One can imagine that bringing the vocal apparatus into a different configuration, brings a higher efficiency of the throughput discussed by Kaiser, and this reconfiguration gives the singer the capacity to produce notes which otherwise would not be possible to sing before the change (a new degree of freedom).

As a way to think about how this is achieved in the mind of a singer, take Luciano Pavarotti, who wrote of the *passaggio*, in his biography: "It is a little like break-

14. Lyndon LaRouche, 1980s memo, "Conjugate, Schrödinger-like Helices as the hypothetical form of propagation of induced transparency for electromagnetic transmission of coherent sound in the air medium."

15. See the Schiller Institute's *A Manual on the Rudiments of Tuning and Registration, Volume I*, "Introduction" (1992).

ing through the sound barrier. If you do it in the right way, it affects what happens on the other side."

This is very important for a singer to know, for an improper shift can throw off the ability to sing into the higher registers of the soprano and tenor voice, past the high B, into the *do di petto*, in the "fourth register." Pavarotti again: "The *passaggio* is also very important in connection with singing the highest notes. If the shift-over from the middle to the upper register is done correctly, it opens up the top much more effectively and those high B's and C's have a better chance of being hit solidly and well."

What else could be happening as one moves into this higher efficiency? And similarly, what could be taking place in the Basso voice, in the shift which seems to be an *inverted* fourth register found in the lowest range of the voice species? Think then, what could be the effects of arbitrarily raising the pitch of orchestras and choruses beyond the natural, Verdi-promoted tuning of C=256, even if by "just a little bit"?

Given this delicacy of the work accomplished by this jet flow, in its negentropic action on the whole vocal tract, which is unified by the geometry of the tract, the *bel canto* register shift has some very interesting implications in communicating subtleties in performance of music by a composer who knows how to use this higher dimensional power, such as Bach, Mozart, Beethoven, or Verdi.

To "play" the human voice, which every human being has been given "in the box," so to speak, the singer has the challenge of using a living process to make music, and this is what is reflected in the fluid dynamics of vocal production and the use of register shifts. Not only can the voice expand its otherwise small range by this action, which exists in the *bel canto* voice, but it brings a higher, willful organization of the whole geometry of the action taking place, which must be thought of as received, even if "ever so slightly," by the conscious, non-sleeping members of the audience.[16]

Riemann's Posthumous Hearing

The possibility of human hearing going beyond the simple assumptions of sound, was not discounted by Bernhard Riemann in the last researches of his life. Riemann begins, in his posthumously published paper, "The Mechanism of the Ear," very generally on the question of investigating any sense organs, and only after he lays out the method of proper inquiry for himself does he go "into the ear," so to speak. Keeping in mind what's been said up until now in our reports, both tasks are relevant for us here.

In this late work, Riemann takes the same creative approach which he had developed going back to his 1854 *Habilitation Dissertation*, and other work. That is: Don't trust your assumptions, ever! For the universe is creative everywhere, even when you are not watching it. In investigating what we sense, we should keep in mind that there must be things which we cannot discount, even though we don't know they exist yet.

Riemann writes that, to study the physiology of a sense organ, there are, "aside from the universal laws of nature," two necessary elements: one, the empirical determination of what the organ accomplishes, and two, the investigation of its construction. From the need to understand the organ's function, there are two possible ways of acquiring this knowledge: either one can look at the parts of the organ, and then impose an assumed interaction on these parts as a result of the external stimulus, "or we can begin with what the organ accomplishes and then attempt to account for this.... By the first route, we infer the effects from the causes, whereas by the second route we seek causes of given effects." He calls the first route the synthetic route, and the second, the analytic route.

Senses can receive unimaginably small details. As we have discussed above, and in several other papers in this report, very fine details often go unnoticed; therefore, this first route of synthesis is too difficult to use. Riemann writes that the determination of the finer characteristics from observation of microscopic objects, "is always more or less uncertain." And therefore, by following the second route, we shall "seek to account for what the organ accomplishes."

"We must, as it were, reinvent the organ, and insofar as we consider what the organ accomplishes to be its purpose, we must also consider its creation as a means to that purpose. But this purpose is not open to speculation, but rather, given by its experience, and so long as we disregard how the organ was produced, we need not bring into play the concept of final cause."

This is the exact same methodological approach Johannes Kepler used, when he asked of the eyes, over 200 years before Riemann, in his *Harmonies of the Worlds*, "Certainly the mind itself, if it never had the

16. Just as Dante suggests, in his epic poem, the *Commedia*, the person sitting next to you may look alive, but their soul might already be suffering in Hell.

Kepler (left) asked of the eyes, in his Harmonies of the Worlds*, "Certainly the mind itself, if it never had the use of an eye at all, would demand an eye for itself for the comprehension of things which are placed outside it, and would lay down laws for its structure which were drawn from itself. For, recognition of quantities, which is innate in the mind, dictates what the nature of the eye must be; and therefore, the eye has been made as it is, because the mind is as it is, and not the other way round." Riemann, 200 years later, asks the ear, "What do you accomplish?" The ear answers, "several things, such as a extremely precise discrimination of sound, sensitivity, fidelity of transformation."*

use of an eye at all, would demand an eye for itself for the comprehension of things which are placed outside it, and would lay down laws for its structure which were drawn from itself. For, recognition of quantities, which is innate in the mind, dictates what the nature of the eye must be; and therefore, the eye has been made as it is, because the mind is as it is, and not the other way round."

So Riemann asks the ear, "What do you accomplish?" The ear answers, and tells him, "several things, such as an extremely precise discrimination of sound, sensitivity, fidelity of transformation." Riemann includes descriptions of "timbre, intensity, tone and direction," as the parameters for the effects received by hearing. He later describes these each in with their own properties, and judges the ear's fidelity and sensitivity to such things, from experiments done before him, and also, from personal experience found in the subtleties in both poetry and live music.

Riemann's critique of Helmholtz's book, *On the Sensations of Tone*, is that the work improves upon the empirical data then existing, but nothing else, and Riemann himself is "frequently compelled to oppose the conclusions that Helmholtz draws from his experiments and observations." So, what could Riemann have been looking for?

Recall the investigations of Kaiser and Teager. They were led to understand that the voice is not what it was assumed to be, and they found that the ear is responding to this process of complexity in speaking and singing as well, mostly without us consciously knowing it. Kaiser said: "[I]f you listen to somebody talk on the telephone, it only takes a second or so of conversation for you to know who is talking, in addition to what was said. If you try to do that analysis spectrum-wise, you'll find that you can't. But this approach is doing it just fine. Why? Because one's ear is looking at the modulations. It's a modulation detector. It's a transient detector. It's not simply a spectrum analyzer. It's a lot more."[17]

For further evidence of what Riemann might be looking into the ear for, we shall revisit his earlier "Philosophical Fragments."[18]

"With each simple act of thought, something enduring, substantial, enters into our soul. This substantial thing appears to us, indeed, as a unity, it appears, however (insofar as it is the expression of a spacial and temporal extension), to contain an inner manifoldness; hence, I call this a *"thought object"* [*"Geistesmasse"*]. All thought is, according to this, the formation of new thought-objects.

"The thought-objects entering into the soul, appear to us as conceptual representations; the distinct inner state of each conceptual representation determines the unique quality of them.... All beginning, generation, all formation of new thought-objects, and all unification of the same, require a material carrier. Hence, all thinking comes to pass at a determined place."

And later he writes, "In order to explain our soul-life, we must assume that the thought-objects produced in our nervous system endure as a part of our soul, that their interconnections continue unchanged, and they are subjected to a change only insofar as they enter into a connection with other thought-objects."

These ideas, along with what Kepler wrote, form a

17. See note 1.

18. A translation of Riemann's *Philosophical Fragments* can be found in the Winter 1995-1996 edition of *21st Century Science & Technology* magazine.

good place to understand the mind's use of the senses.

Now go back for a moment, and think about what the voice is doing for the mind in using register shifts. Why do register shifts exist, but to communicate to the mind? The resonance within the ear must ascend to the subjective resonance within the mind which re-forms the idea. This presupposes that the mind is tuned to the reception of such slight indications. That puts the performer and the audience at a much higher responsibility and attention than anyone is wont to do these days, and that brings us to the next part of this study.

MP3s Versus Your Ears

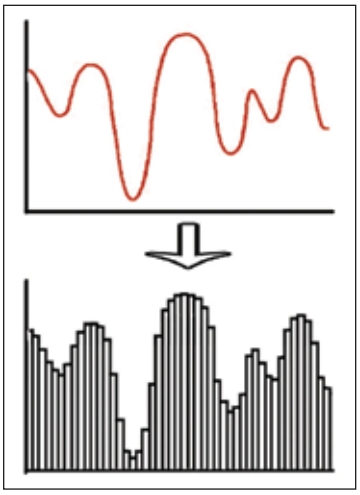
To get into the implications of this discussion on the subject of digitized music, the following recap is necessary.[19]

When a recording is made, the assumptions embedded in the method of sound production are the same as those which come from Helmholtz. And if we make assumptions about what sound is, then our recording devices will take the parameters associated with sound, and strive to recreate those effects. When recording was first developed in the late 1800s and early 1900s, the method was straightforward: A device must receive the effects of the sound vibrations in the air, and those vibrations had to be transferred into a medium—wax or a soft plastic; when the sound is reproduced, those vibrations are sent backwards, via a needle, to a device to recreate the recorded vibrations. This was good enough, assuming that that is all that must be captured.

Technology advanced from wax to vinyl records, and also to magnetic tape, all the while, remaining "analog." The step to "digital" recordings was taken, as in Laserdisc, CD, mp3, WAV, etc. Whatever the reasons given, it was a most dangerous step. The data played back was shrunk, "to the limits of human perception," and the sound emitted is only an approximation of the original sound.

Keep in mind, that the unimportant "extraneous noises," which are cut out of digital recordings, are the signals that are "too high" or "too low," for human hearing. It is assumed that young people can hear up to 22,000 Hz, while most adults can't hear frequencies higher than 15,000 Hz. "So," the typical audio engineer says, "provided that the sample is sufficiently in-depth, there is no audible difference between an analog original and a digital transfer of it. Our ears cannot tell the difference."

FIGURE 3



The transfer of the original sound into digital information can be seen in these curves and rectangles shown above. In the digital recording: X = the sample rate, i.e., samples per second (measured in Hz), and Y = the resolution, i.e., the amount of divisions of the unit (measured in bits). X and Y give you the bit rate, i.e., the amount of data taken per second.

The question now posed is, "Is the mind which uses those ears listening?"

In a digital recording, what can be thought of as the "living-noëtic sound" of the performed music is assumed to be reducible. It is as if your dog were cut into a thousand parts, those parts were then frozen in ice-cube-like chunks, and then your dog was reassembled of these chunks in the shape of the dog. Playing fetch would be a difficult task.

Remember, the electromagnetic component of "unheard melodies," as from an aurora, have not yet been recorded by any device, analog or digital, yet people are able to respond both consciously and unconsciously to these "sounds." What then might be lost as a result of digital recordings (or perhaps any recordings) of Classical musical compositions? How much of the nuance is lost in the forced digitalization of such performances which utilize the slight changes, as the register shifts imply, as discussed above?

Taking the approach of Riemann, while thinking about these phenomena, taking the implications of the complicated process in human singing and register shifts, the assumptions of regular sound mechanics really do "confine" what we could be hearing, and therefore, should be thrown out the window, along with your collection of mp3s.

With this process in mind, think of another interesting aspect of the Classical musician's power to communicate: silence. Silence is very important in composing and performing Classical music. It is the apparent *nothing* that causes that which follows it. The greatest performers speak of a unique musical silence as something

19. See Sky Shields, "What, Exactly, Is a Human Being? Analog, Digital, and Transcendental," *EIR*, Jan. 4, 2008.

which could not be reduced to just a "lack of sound." A deeper study of a Beethoven piece, where one might find a *fermata*, also known as a *corona*,[20] over a rest, would reveal an entire world of "unheard" substance.

To hint at the idea, a very accomplished pianist once told me, "For Beethoven, silence becomes the most beautiful music. He provides you with a dense moment, which, in performance, must be defined by many factors.... This pause must reflect a total change in the idea, of the overall space. It is much more difficult to play silence, because it must be determined by the conditions of the whole concert, by the state of the audience, the way the entire night has gone, in other performances, and by the way you've shaped the whole performance until that moment. This expression of musical silence must be determined by all this, and you have to be aware of all of it in this instant when you create it." Any reconstruction of so-called "silence" must necessarily discount this idea; it could only be read as, "no information = empty space." Would you really want to put that into your head through your earphones?

When human beings communicate, is it only information? In speaking, saying one thing, with the raising of an eyebrow, and then, saying the same thing, without the facial gesture (and thus, expressing something beyond both), is not something that can be reduced to "information." Imagine a population which has lost its access to these ironies, through a degeneration of music and of speaking. Imagine after decades that this population would lose the ability to recognize these ironies. Their science suffers, their art suffers, and ultimately their humanity suffers. Morality becomes only an opinion, and chaos rules, until they can no longer economically care for themselves.

Such were the intended results wrought upon our own society beginning at the turn of the 19th Century into the 20th Century by such scoundrels as Bertrand Russell, C.K. Ogden, and Sidney Hook. That degeneration, which we experience in music and culture today, was the intended effect of the infamous Congress for Cultural Freedom.

Why was this done to us, you ask? "Learn to know thyself," was the advice given to Prometheus, as he fought against the new tyrant Zeus, in Aeschylus' drama, *Prometheus Bound,* of ancient Greece. This was one of the mottoes inscribed at the wall of the temple at Delphi at the time. The other motto which often accompanied it was, "Think as a mortal." This addition gives the first motto a "know your place, and keep in your place," or "don't act or think outside your station in life" kind of command from the Delphic order. This comment, at it comes from Oceanus' mouth in Aeschylus' drama, would resonate among the Greek audience watching the play, for it was a well-known command at the temple. This Delphic control can be seen as a model for the Congress for Cultural Freedom, as they would embrace this dictum in its new form, "Hear as a mortal."[21]

Some Final Considerations

As Shawna Halevy has recently developed the point in the case of Albert Einstein,[22] the scientific mind's ability to passionately investigate the reality of the universe which lies to the other side, so to speak, of our sense perceptions, is developed in Classical expressions of artistic composition. Debating analog or digital is missing the more important point: Participating in a live audience which intently listens to the mind of the composer emanate through the performance, will always be superior to any recording.

Think of the connection of the performer to the audience at those dense moments of thought-filled silence: Is there something more taking place, on a higher level of communication? Could a virtual chorus or virtual symphony ever communicate that?[23] That special power, which exists as a chain of minds singly, magnetically linked in a performance of a great work, from composer to conductor, to musicians, and to the audience, is a special human power which breaches clock time, and unites all participating souls in a moment of heavenly eternity. Such silent power is what Keats reflected upon in the last stanza of his "Ode on a Grecian Urn" (see box). To perceive these finer effects which we've discussed, requires a cultural development, and

20. The difference of terms is important; *fermata*, a more recent name for this notation, means stop, or halt; while *corona*, on the other hand means, "crown," or, as a verb, "to fulfill."

21. It is worth noting, that Aeschylus' Prometheus clearly shows his contempt for this command, and inspires the audience to do the same. Plato took up this command in his *Alcibiades* dialogue, and in the *Apology*. He turns the command on its head, and gives it the significance that civilization attributes to it ever after: "The unexamined life is not worth living."

22. See the video, "The Genius of Albert Einstein." http://www.larouchepac.com/node/15482, and Shawna's unpublished notes on Einstein's connection to his music.

2323> Eric Whitacre's Virtual Choir—"Lux Aurumque": http://www.youtube.com/watch?v=D7o7BrlbaD

to perceive what is beyond those subtle hints, is a result of thousands of years of tuning into these creative processes of art, science, language, and politics.

The tragedy of our contemporary situation is the lack of perception of another sense, a sense of history. The cultural implications of this attack on U.S. and European culture, cannot to be denied. Young people in our time, more and more, go though life assuming that the things that shape their opinions and their actions and emotional reactions, and thoughts, are all a product of their personal experience, their sense experience in their lifetimes. So what could LaRouche be possibly tapping into, when he speaks of being "3,000 years old, in terms of experience"? Do his senses extend to places beyond his life? If you think of senses now being tuned to the finer subtleties of the mind, yes. A sense of history is the finest sense possessed by most historic figures, like an FDR, a Lincoln, a Bismarck, and poets like Shelley, Shakespeare, Dante, or Homer.

Mozart's moral challenge to the audience through his opera "Don Giovanni," Beethoven's commitment to beauty in his combination of voices and instruments in his 9th Symphony, and these pieces worked on from the *bel canto* tradition, in the natural tuning of C=256: This is the mission embarked upon by the LaRouche Movement today. Such challenges are the only gifts by which our destroyed generations may re-tune themselves with human history.

There are many questions which remain to be addressed in the discussion of hearing, singing, and human communication through reliving Classical compositions. What even finer senses still exist in human beings which we deafen and blind ourselves to all the time in our society? To free our minds from the blindness of sense perception, miraculously, as Helen Keller did, will give us the power to create a future for mankind.

Ode on a Grecian Urn (1819)

by John Keats (1795-1821)

Thou still unravish'd bride of quietness,
Thou foster-child of silence and slow time, Sylvan historian, who canst thus express
A flowery tale more sweetly than our rhyme: What leaf-fring'd legend haunt about thy shape
Of deities or mortals, or of both,
In Tempe or the dales of Arcady?
What men or gods are these? What maidens loth?
What mad pursuit? What struggle to escape?
What pipes and timbrels? What wild ecstasy?
Heard melodies are sweet, but those unheard
Are sweeter: therefore, ye soft pipes, play on; Not to the sensual ear, but, more endear'd,
Pipe to the spirit ditties of no tone: Fair youth, beneath the trees, thou canst not leave
Thy song, nor ever can those trees be bare;
Bold lover, never, never canst thou kiss, Though winning near the goal—yet, do not grieve;
She cannot fade, though thou hast not thy bliss,
For ever wilt thou love, and she be fair!
Ah, happy, happy boughs! that cannot shed
Your leaves, nor ever bid the spring adieu; And, happy melodist, unwearied,
For ever piping songs for ever new; More happy love! more happy, happy love!
For ever warm and still to be enjoy'd,
For ever panting, and for ever young; All breathing human passion far above,
That leaves a heart high-sorrowful and cloy'd,
A burning forehead, and a parching tongue.
Who are these coming to the sacrifice?
To what green altar, O mysterious priest, Lead'st thou that heifer lowing at the skies,
And all her silken flanks with garlands drest? What little town by river or sea shore,
Or mountain-built with peaceful citadel,
Is emptied of this folk, this pious morn? And, little town, thy streets for evermore
Will silent be; and not a soul to tell
Why thou art desolate, can e'er return.
O Attic shape! Fair attitude! with brede
Of marble men and maidens overwrought, With forest branches and the trodden weed;
Thou, silent form, dost tease us out of thought As doth eternity: Cold Pastoral!
When old age shall this generation waste,
Thou shalt remain, in midst of other woe
Than ours, a friend to man, to whom thou say'st, "Beauty is truth, truth beauty,"—that is all
Ye know on earth, and all ye need to know.