

EIR Feature

Revive Verdi's tuning to bring back great music

In September, the Italian Parliament will be called upon to vote on legislation governing the correct tuning for musical performance. This most unusual bill was introduced by Christian Democratic Senators Carlo Boggio and Pietro Mezzapesa. We publish here the full text of the report introducing the legislation, followed by the bill itself. Elsewhere in this package, you will find highlights of the international press controversy over "the war of the tuning forks," and an interview with Lyndon H. LaRouche, Jr., who inspired the research project that led to this initiative.

DRAFT LAW

Report: Standardization of the basic pitch of musical instruments

Honorable Senators: In recent weeks, we have been called upon to find a lasting solution to the continuing uncertainty and variability in the basic pitch of musical instruments, which is revealed as harmful and dangerous not only for singers' voices, but also for our instrumental patrimony, and in particular, for the antique string and keyboard instruments (violins, violas, violoncellos, not to mention organs and fortepianos constructed for a tuning not above a concert A between 427 and 435 cycles per second). The "race to the high pitch" which we have witnessed for decades, justified by some with an erroneous interpretation of the concept of "artistic liberty" which itself threatens such liberty, rendering artistic expression impossible, and which has brought us to distortions such as the stratospheric tuning of some opera houses (Vienna, Berlin, Florence, Dresden), which risks making it impossible to correctly interpret masterpieces such as the symphonies of Mozart, Haydn, and Beethoven, and could, according to the testimony of famous operatic performers and orchestra conductors cited in this report,



Claudio Rossi

A press conference in Rome on July 13 presents the legislation that will be debated by the Italian Parliament. Right to left: Sen. Pietro Mezzapesa, one of the sponsors of the bill; Liliana Celani of the Schiller Institute; baritone Piero Cappuccilli, one of the internationally renowned opera singers who is spearheading the campaign for a scientific tuning.

bring us to a situation in which, within a few years, it will not be possible to stage numerous lyric operas, due to the lack of voices suited to the repertoire.

The cause of this situation, which is extremely troubling in a country which is renowned the world over as the cradle of music and of bel canto, is in the "free fluctuation of the A," which does not take into account the physical, morphological, and moral laws which are the foundation of great music, just as they are for every other expression of human life.

Unable to remain indifferent to the heartfelt appeal that has reached us from the entire musical world, we will therefore analyze in this report the causes of such fluctuations of the A, and we will offer the possible solutions for standardizing the diapason, certain that you will agree on the necessity to enact today a decree such as that which Giuseppe Verdi caused to be enacted by the Italian government in 1884, for the same reasons that we submit today to your attention. In order to facilitate comprehension of the argument even to those not familiar with the subject, we will divide our report into six principal arguments: the history of pitch, the damage to voices and to the instrumental heritage provoked by the raising of the tuning, the alteration of the musical language that derives from it, the physical aspects, and finally, an international panorama of the requests for action coming from the whole music world.

1. The history of tuning pitch

In 1884 the Ministry of War issued a decree for the nor-

malization of the tuning pitch to an A of 432 vibrations, which had been vociferously requested by G. Verdi and by all the Italian musicians meeting at a congress in Milan in 1881. The decree, preserved at Milan's G. Verdi Conservatory, affirms among other things that:

"The Ministry of War has now prescribed that the orchestra instruments and those of military bands all be tuned above a B-flat (index 3) of 456 complete vibrations, derived from a normal A (index 3) of 432 vibrations. It came to this decision taking the opportunity of the formation of 16 musical bands of the new infantry regiments, for instruments would need to be provided: and certainly a better occasion could not present itself for obtaining a higher perfection and uniformity in the standards, and in order to remedy the confusion which until now reigned sovereign in the tuning of the instruments, by taking a decisive step toward a rational solution, supported by scientific reasons, and artistically satisfying.

"It would be superfluous to repeat here the lengthy history of the attempts made to reduce the various tunings to only one, typical and universal. And, as the illustrious Verdi well said, it seems incredible that it has not yet been possible to make everyone understand that it is truly incongruous that in Rome they call A what in Paris is called B-flat, while music is one thing the world over, and musical notes are as eternal and immutable as the physical laws on which they depend!

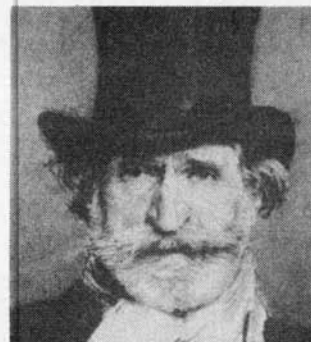
"Many masterpieces of yesteryear were evidently written under the influence of a very moderate tuning fork. And therefore, with our too high tuning forks they are today no longer reproducible, or are reproducible only at the cost of

spoiling their sonority. Perhaps one is not straying far from the truth to state that the old pitches, which really were judiciously measured against the natural range of the human voice, differed by about a half-tone from the higher pitches of today. And in fact, the scientific concert pitch of 432 vibrations would be almost a half-tone away from today's highest tuning forks. The musical Congress in Milan studied the subject from a more complex and more scientific point of view, as we will show below."

In a letter to the musical commission of the government, reported by the 1884 decree, Giuseppe Verdi wrote:

"Since France has adopted a standard pitch, I advised that the example should also be followed by us; and I formally requested that the orchestras of various cities of Italy, among them that of the Scala [Milan], to lower the tuning fork to conform to the standard French one. If the musical commission instituted by our government believes, for mathematical exigencies, that we should reduce the 435 vibrations of French tuning fork to 432, the difference is so small, almost imperceptible to the ear, that I associate myself most willingly with this.

"It would be a grave, extremely grave error, to adopt, as proposed from Rome, a standard pitch of [A =]450!!! I also am of the opinion with you that the lowering of the tuning in no way takes away the sonority or liveliness of the execution; but gives on the contrary, something more noble, of greater fullness and majesty than the shrieks a too high tuning fork could give.



Giuseppe Verdi

"For my part, I would like a single tuning to be adopted in the whole musical world. The musical language is universal: Why then would the note which has the name 'A' in Paris or Milan have to become a B-flat in Rome?"

"I have the honor to address myself to you most devotedly,

"Giuseppe Verdi."

The "standard pitch" (A = 435) to which Verdi refers is that preserved at the Museum of the National Conservatory of Paris, while the so-called "scientific pitch" to which the decree refers (A = 432) and which was approved unanimously at the congress of Italian musicians of 1881, is that proposed by the physicists Sauver, Meerens, Savart, and by the Italian scientists Montanelli and Grassi Landi, and calculated on a Middle C (index 3) of 256 cycles per second, as will result from the treatment of the "physical aspects" of the tuning pitch. It is important to underline that the race to the high tuning began, instead, with the unilateral adoption of a high A (440 cycles) by the Russian and Austrian military bands in the time of Wagner, and that such a pitch, although it lacked any scientific justification or basis in the laws of the human voice, was later accepted by a convention in London, in 1939, as the "standard pitch," to which, in any case, no orchestra in the world, or nearly none, adheres.

Until the Italian decree of 1884, the "fluctuation of the pitch" was that shown in **Table 1** (stipulating that, from the reference point of A at 440 hertz, in recent years it has moved enormously to the point of reaching 456-460 hertz). Consequently, it is amazing to discover the pitch levels to which musicians of past centuries were accustomed.

It is evident that the 18th-century musicians far away from each other in terms of culture, tradition, experience, aspirations, and investigations, were nevertheless close to each other, under the banner of a reigning coherency, in "defending" in practice a tuning pitch which was "sensible and respectful of convention." The mean value which comes out of these, 432.9 Hz, is proof of this.

If we ascertain that, between today's average values, rotating around 445 Hz, and the Mozartian 422 Hz, the difference is about a semitone, it is easy to understand how, on

A short glossary

Agogic: refers to qualification of expression, in particular, accentuation and accent, where this concerns variations of duration rather than dynamic.

Diapason: a standard of musical pitch, or a tuning fork. Because the term is less commonly used in English for these meanings, our translation renders the Italian word "diapason" as standard pitch, tuning pitch, tuning fork, or "concert A," depending on the context.

Fortepiano: the wooden-frame keyboard instrument invented by Cristofori in the 1700s and used until around 1850, when it began to be replaced by its modern metal-frame relative, here called "pianoforte" or "piano."

Glissando: a gliding effect produced by executing a series of adjacent notes in rapid succession.

Index: the octave in which a given note occurs, identified by reference to the piano keyboard. In the system used here, the lowest C on the piano begins the octave of index 1; Middle C begins the octave of index 3.

Tessitura: (Italian for "texture"), a vocal term used both to describe the average range of notes most frequently sung by a given voice in a given composition; and by extension, to name that species of voice which sings in a given "tessitura."

TABLE 1

Year	City	Person	Concert A
1751	London	Personal tuning pitch of Handel	423 Hz
1752	Berlin	(Opera) according to Marpurg	422 Hz
1754	Lille	Tuning pitch of Francois	423 Hz
1780	Vienna	Stein pianoforte for Mozart	422 Hz
1780	Dresden	Tuning pitch of Kirsten	422 Hz
1780	Padua	Tuning pitch of Colbacchini	423 Hz
1780	Verona	Tuning pitch of Cavedini	422 Hz
1800	Lille	Tuning pitch of Cohen	429 Hz
1800	Dresden	Tuning pitch of Kummer	429 Hz

the one hand, voices and instruments are straining to reach a tuning not foreseen by the composer in the outer tessituras, while on the other, the compositions we hear have nothing to do, in their tonal aspect, with the actual "color" of the keys perceived by the author.

Around the 1830s, the "status" begins to undergo modifications imputable to that combination of peculiarities which

distinguishes the romantic repertoire, be it vocal, and/or instrumental (Table 2).

The epoch of the 1800s is a swarm of ups and downs of pitch in which inconsistency predominates to demonstrate the arbitrariness and insensitivity of the professionals, almost estranged and disinformed about the artistic incongruity created by the lack of respect for the pitches intended by the composers in the writing of the compositions (it should not be forgotten that the use of the outermost tessituras, high or low, was calibrated in such a way as not to allow deviation, except at the risk of getting voices and instruments into real trouble).

And the contradictions become even more upsetting if one reflects upon the appeals, quite often falling on deaf ears, of composers invoking respect for the tuning pitch (Verdi, Ponchielli, Pedrotti, Bazzini, Boito, Faccio, Marchetti, Lauro Rossi) (Tables 2-3).

Starting in the 1880s, there appeared the first official attempts to impose a reference point on the chaos unleashed in musical performance. But neither the International Congress of Vienna of 1885 (which was linked to the work of the Commission of Paris of 1858, for the standardization of pitch to 435 Hz, which was followed by the establishing decree of

TABLE 2

Concert A in various European cities

1833-1834		1858		1859*	
City	Concert A	City	Concert A	City	Concert A
Weimar	Hz 424	Toulouse	437 Hz	Paris	435 Hz
Stuttgart	Hz 440	Bordeaux	443 Hz	Toulouse	437 Hz
Berlin	Hz 437	Marseilles	448 Hz	Toulouse	442 Hz
Berlin	Hz 442	Lille	452 Hz	Lyons	448 Hz
Vienna	Hz 434	Paris	444 Hz	Bordeaux	444 Hz
Vienna	Hz 439	Paris	448 Hz	Lille	452 Hz
Vienna	Hz 439	Paris (proposed by the Conference)	435 Hz	Marseilles	447 Hz
Vienna	Hz 445	London	455 Hz	Munich	448 Hz
Paris	Hz 430	London	443 Hz	Weimar	445 Hz
Paris	Hz 435	Brussels	445 Hz	Braunschweig	443 Hz
Paris	Hz 443	Budapest	446 Hz	Karlsruhe	435 Hz
		Madrid	444 Hz	Stuttgart	446 Hz
		St. Petersburg	436 Hz	Dresden	441 Hz
		St. Petersburg	451 Hz	Wurtemberg	445 Hz
		Naples	445 Hz	Berlin	452 Hz
				Holland	446 Hz
				Prague	450 Hz
				Brussels	442 Hz
				Budapest	446 Hz
				Liege	448 Hz
				Turin	445 Hz

*Year of the imperial French decree which imposed a standard pitch at A = 435 Hz

Oct. 17, 1858, the imperial decree of Feb. 16, 1859, and the decree of enactment of the law of May 31, 1859), which in Italy led to the Oct. 30, 1887 decree and the decree of the Ministry of Public Instruction of May 30, 1888 fixing the pitch at 435 Hz, nor the recent provisions (decree law of the Kingdom of Italy of Dec. 17, 1936 = diapason 435 Hz) or informational initiatives (International Conference "International Standard Organization" London 1938/9 + floating diapason 442/443 Hz, Convocation of the European Council, 1968 Salzburg; 1969 Florence; 1970 Toledo with the status of the pitch between 437 and 450 Hz; Italy, 30 June 1971, resolution on the standardization of the tuning frequencies 440 Hz), have brought peace into the universe of sound. **Table 4** gives the puzzling picture of this.

2. The damage to voices

At the international conference on "Verdi and the Scientific Diapason" held at the Casa Verdi in Milan on April 9, 1988, at the initiative of the Schiller Institute, speakers Renata Tebaldi, Piero Cappuccilli, and Prof. Bruno Barosi of the

TABLE 3
Essential data for the decade 1875-1885

Date	City	Concert A
1874-76	London	454 Hz
1877	London	455 Hz Wagner Festival
1877-80	London	449 Hz Covent Garden Harmonium 1
1877-80	London	447 Hz Covent Garden Harmonium 2
1877-80	London	441 Hz Covent Garden Organ
1877-80	London	446 Hz Covent Garden Organ
1877-80	London	450 Hz Covent Garden Orchestra in education course
1880	London	455 Hz tuning pitch of Erard
1880	London	455 Hz tuning pitch of Steinway in England
1880	London	435 Hz tuning fork used in Covent Garden to tune the orchestra
1878	Vienna	447 Hz Opera House, according to Ulmann
1876	Brussels	432 Hz proposed by Meerens for concerts
1878	Dresden	439 Hz according to Jemlich
1880	Boston	448 Hz according to Nichol; tuning fork in use for an orchestra made up almost entirely of Germans
1880	Cincinnati	456 Hz tuning pitch used in Thoma's Orchestra
1880	New York	457 Hz tuning pitch of Steinway
1879	Hamburg	448 Hz Opera House

International Institute of String Instrument Building of Cremona presented exhaustive reports on the damage caused by the high tuning to voices and instruments. Their arguments were confirmed by hundreds of singers and instrumentalists all over the world, and by orchestra and chorus directors such as Maestros Gavazzeni, Chailly, Sacchetti, Allorto, Rigacci, and Sanzogno. Baritone Piero Cappuccilli gave, at the Casa Verdi, concrete examples of the problems provoked by the high tuning for the interpretation of the works of Verdi, by singing two famous arias from the operas "Ernani" and "Il Trovatore" accompanied by Maestro Baracchi, first on a piano tuned for the occasion to Verdi's A (432 cycles) and immediately afterward on a concert grand tuned to the high A of today. The performance clearly demonstrated to all the 300 singers and musicians present how with the high tuning, not only the registral passages of the voice, which are crucial for Italian bel canto school, are arbitrarily changed, but also the "very color of the voice," which takes on tenor qualities (in the case of the baritone) against the will of the composer. "If in the epoch of Verdi the pitch was [A] 432 vibrations," Cappuccilli said, "and he wrote his operas for this tuning, Verdi was an intelligent person who understood voices and wrote for voices. Taking the pitch up to the present level, the strain on the vocal cords is too accentuated. This is why many singers after four, five, or six years of their careers, encounter great difficulties. Because they are straining the vocal cords in an unnatural way."

Renata Tebaldi reminded the Milan conference that singers construct with great care the proper vocal registers, and that when they find themselves thrown off from the original key in which the opera they are singing was written (which is respected only by respecting the pitch at which the opera was written) to an incorrect key, they realize it immediately, because of the fact that each note in the vocal scale has its "place," in the placement given by bel canto technique, and when the singer looks for that place and cannot find it, it feels as if one shot a billiard ball that did not go into the pocket. The obvious consequences are: shouty sounds, a constant straining of the throat, breaks in the voice, and in the long run, real throat problems which have cut short otherwise promising careers. "I cannot believe that Italy, which gave to the world the most beautiful voices, and has carried our bel canto and our marvelous Italian language everywhere, can no longer produce great dramatic-soprano voices, and true mezzosopranos, with the color of mezzosopranos, and true deep basses," said Renata Tebaldi. "If we went back to the correct tuning, I am sure that we could return the Italian opera to its Golden Age."



Renata Tebaldi

TABLE 4

Year	Place	Concert A	Year	Place	Concert A
1885	Conference of Vienna for the standardization of the pitch	Hz 435	1955	Resolution of the International Standard Organization	Hz 440
1885	Cappella Giulia, St. Peter's (Rome)	Hz 384 ¹	1963	Radio Eireann, Dublin	Hz 442
1887	Legal Italian diapason	Hz 435	1967	Orchestra della Radiotelevisione Italiana, Turin	Hz 441-443 ¹⁰
1892	Association of Manufacturers of Pianoforte	Hz 435 ²	1967	Orchestra della Radiotelevisione, Milan	Hz 442-443 ¹⁰
1936	Legal Italian diapason	Hz 435	1967	Orchestra della Radiotelevisione, Rome	Hz 445-447 ¹⁰
1939	Deutschland Schuder Phys-Tech. Reich	Hz 440	1967	Orchestra della Radiotelevisione "A. Scarlatti," Naples	Hz 444-445 ¹⁰
1939	WWW (U.S.A.) Bureau of Standards	Hz 440	1968	Orchestra della Radiotelevisione Italiana, Turin	Hz 442 ¹⁰
1939	Various Italian measurements (EIAR included)	Hz 435-448 ³	1968	Proposal of the Working Group of the Council of Europe	Hz 440 ¹¹
1939	United Kingdom (average measurement)	Hz 438.5	1968	Federal Republic of Germany	Hz 440-442 ¹²
1939	Low Countries (average measurement)	Hz 439.5 ⁴	1968	Russia	Hz 437.5-442 ¹²
1939	France (average measurement)	Hz 440.5 ⁴	1968	Denmark	Hz 439-442.5 ¹²
1939	Paris	Hz 448 ⁵	1968	France	Hz 440-445 ¹²
1939	Germany (average measurement)	Hz 441.5 ⁴	1968	Great Britain	Hz 440 ¹²
1939	Berlin	Hz 452 ⁵	1968	Ireland	Hz 440-442 ¹²
1939	Belgium (average measurement)	Hz 442 ⁶	1968	Italy	Hz 435-445 ¹²
1939	Germany	Hz 442 ⁶	1968	Yugoslavia	Hz 440 ¹²
1939	France	Hz 442 ⁶	1968	Austria	Hz 443.5-445 ¹²
1939	Holland	Hz 440 ⁶	1968	Poland	Hz 440 ¹²
1939	Italy	Hz 442 ⁶	1968	Switzerland	Hz 440-442 ¹²
1939	England (average measurement)	Hz 443 ⁶	1968	Spain	Hz 435 ¹²
1939	Portugal	Hz 451 ⁵	1968	Brussels, Théâtre Royal de la Monnaie	Hz 442-450 ^{**13}
1939	United States (average measurement)	Hz 440 ⁶	1968	Radio-Télévision Belge	Hz 437-444 ^{**13}
1940	Teatro Carlo Felice of Genoa	Hz 442-443 ⁷	1968	Orchestre Philharmonique de l'ORTF	Hz 444-452 ^{**13}
1940	Teatro Verdi, Parma	Hz 437.3-438.3 ⁷	1968	Paris, Orchestre Nationale	Hz 441-449 ^{**13}
1940	Teatro dell'Opera, Rome	Hz 440.3-443 ⁷	1968	Paris, Orchestre Lyrique	Hz 441-450 ^{**13}
1940	Teatro alla Scala, Milan	Hz 441.5 ⁷	1968	Ireland	Hz 442-443 ^{**13}
1940	Teatro San Carlo, Naples	Hz 440 ⁷	1968	Teatro alla Scala, Milan	Hz 437-450 ^{**13}
1941	United States (average measurement)	Hz 434-448 ⁸	1968	BBC, London	Hz 440-447 ^{**13}
1951	Istituto Elettrotecnico "G. Ferraris" Turin	Hz 440	1968	Hessischer Rundfunk Frankfurt	Hz 442*
1953	Europe: pianofortes and organs (average measurement)	Hz 437-444.5 ⁹	1968	RIAS, Berlin	Hz 448*
1953	String orchestras (average measurement)	Hz 439-448.5 ⁹	1968	Westdeutscher Rundfunk, Cologne	Hz 442
1953	Symphony orchestras (average measurement)	Hz 437-449.5 ⁹	1968	Radio-Télévision Belge: organ	Hz 448*
1953	Tonhalle of Zurich	Hz 440	1968	Radio-Télévision Belge: pianoforte	Hz 443*
1953	London: International Conference for the standardization of the musical tuning frequency	Hz 440	1968	Radio-Télévision Belge: orchestra	Hz 444*
			1968	ORTF, Paris: pianoforte	Hz 442*
			1968	Radiotelevisione Italiana: orchestra	Hz 440*
			1968	Radiotelevisione Italiana: pianoforte	Hz 442*
			1968	BBC-London	Hz 440*
			1969	Florence	Hz 444 ^{10,11}

*Data furnished by the organization as the official frequency at the beginning of the performance.

**Maximum and minimum measurements taken from the examination of recordings.

Sources: (1) Grassi-Landi, (2) Koenig, (3) Madella, (4) Van der Pol, (5) Passignalini, (6) Lottermoser, (7) Barone-Tiby, (8) Murphy, (9) Kosters, (10) Righini, (11) Leone, (12) FIM, (13) Sackur.

In an interview with the major German newspaper *Die Welt*, tenor and orchestra director Placido Domingo, who sent a message of support to the Schiller Institute's conference, declared in this regard: "We singers today have to deal with the highest tuning that has existed in the history of music. The 'concert A' keeps going up. Even though there are some who say it is not true, that is the way it is. We must combat this trend. Some orchestras are not only tuned high, but even higher than the others. Once, it was exceptional for the singer to be able to use his head voice, but today we are in a situation which no longer allows us to use the chest voice. It is high time to find a solution to this problem."

Like Cappuccilli and Tebaldi, and the other famous singers interviewed on this subject, Domingo, too, is referring to the fact that in the bel canto school there exist three principal registers, that of the chest, the center of the voice, and the head register, which are distorted at the point when the key, and the tessitura, is changed because of the arbitrary whim of an orchestra director who de facto transposes the work he is performing a half-tone upward, simply in order to obtain a "brilliant" sound with his orchestra. It is, above all, in the passage-notes from one register to the next that singers realize the difference, and the damage done to the voice, and to the interpretation. Carlo Bergonzi and Luciano Pavarotti confirm, for example, that grave problems arise in the opera "L'Elisir d'amore" by Gaetano Donizetti when the tenor must attack the aria "Una furtiva lacrima" on F-natural, and finds himself forced to perform that note in the wrong vocal register because the tonality is too high. In an interview granted to *Il Machiavellico*, Carlo Bergonzi states that many singers, singing in Vienna or Florence, "feel that the acute and so-called brilliant sound of those orchestras, is not natural." "How is it," the tenor wonders, "that there are not as many singers as once there were? And yet there are voices, and how! However, when they arrive at the passage-zone, with the piano tuned high, they feel there is a physical strain. When one feels the physical strain in the high notes or at the passage, then that means that the tuning-pitch is not natural." According to Bergonzi, if one adopted today Verdi's tuning of A = 432, "in five years, one could return to the old days."

Mario del Monaco refused, by contract, to sing "Celeste Aida" with a tuning that was too high, for the same reason: the F-natural which precedes the registral passage from the center to the high register in the tenor's voice. All the singers agree that the problem is not so much in the high notes, which become higher when the tuning is turned up, but in the passage notes, which are the basis for reaching the high notes. Thus, as Bergonzi and Cappuccilli report, the aria "Ah si, bel mio coll'essere," which precedes "Di quella pira" in Verdi's "Trovatore," is often transposed a half-step downward because it relies so much on the registral passage, and no tenor can execute this aria and "Di quella pira," with its final high C, without winding up in the hospital at the end of the performance, unless he goes back to the original key (half a tone lower).

Mirella Freni says, in her interview with *Il Machiavellico*, that a decree like Verdi's would be crucial not only for the new generations of singers, but also for today's singers. "A voice sounds much sweeter if it is not stretched," states the famous soprano. "When one goes from a very high orchestra to another one which is lower, like for example some of the American orchestras, and even a few of others, one feels right away that one is making less effort, it almost feels like not singing."



Mirella Freni

The same goes for the low voices (mezzosopranos, baritones, and basses), as is confirmed by basses Ruggero Raimondi and Nikolai Ghiaurov, and the mezzosoprano Fedora Barbieri, insofar as the tension created on the vocal cords by the unnatural sharpness of the orchestra makes difficult even the low notes, which require a great looseness in the vocal cords themselves. Ruggero Raimondi and Fedora Barbieri indicate, in the interviews they granted to *Il Machiavellico*, another vocal problem, that of the vocal identity of the singer, who will never know if he or she is a bass or baritone, a mezzosoprano or a soprano, a light soprano or a lyric, a light tenor or a lyric tenor, unless he or she sings and studies singing in the right tuning.

"I maintain that it is very important to return the tuning pitch to that which Verdi wanted," declared Ruggero Raimondi. "If Verdi composed a given piece of music, he composed it thinking about certain pitches of sound, which do not correspond to what happens today, with this orchestra pushed to the maximum. This may also be the explanation of many careers which do not go beyond five, six, seven years—even with very beautiful voices. Obviously because of this continual exasperation of a higher sound, they do not succeed in finding the right placement which allows them to sing without straining."

Also Bidu Sayao, the famous Brazilian soprano who was one of the first to sing at the Metropolitan and who signed the popular petition of the Schiller Institute last May, states that "because of the too high tuning pitch, we no longer have dramatic voices, like that of Zinka Milanov. There are no more dramatic tenors, baritones, basses, or sopranos."

All the singers who were questioned by the Schiller Institute, among them Tebaldi, Cappuccilli, Bergonzi and Raimondi, also took note of the fact that during the performance of an opera, the tuning tends to rise as the instruments warm up, above all the wind instruments. "After one act," Cappuccilli stated at the Milan conference, "the orchestra tuning grows even more, and the wind instruments tend to have a louder sound than the voices. Sometimes, when the brasses are playing, even if three Titta Ruffos or three Carusos were singing, you could not hear their voices. By lowering the

tuning pitch, the sound of the orchestra would also become mellower, the winds, but also the violins and 'cellos."

3. Damage to the instrumental patrimony

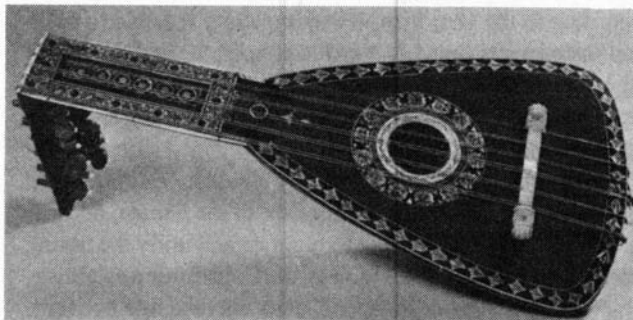
For the stringed instruments and keyboard instruments, similar problems arise to those observed by the singers, and it should not awaken astonishment if one considers that the instruments were built to imitate the human voice, the most perfect instrument, in that it is a living instrument. The experiments conducted in the Acoustical Physics Laboratory of the International Institute of Stringed Instrument Building (Istituto Internazionale di Liuteria) of Cremona, which were presented at the Schiller Institute conference by Prof. Bruno Barosi of that Institute, have had particular international resonance, and have been taken up in alarmed articles appearing throughout the international press (suffice it to mention *Corriere della Sera*, *Le Figaro*, *Le Quotidien de Paris*, *Nordrheinische Zeitung* of Germany, and the Swiss daily *La Suisse*.) Professor Barosi reports that "the increase in frequency involves for the violin serious and not easily solvable problems. The increase in tension on the strings provoked by a higher tuning involves, in fact, an increase in the forces acting on the structure of the case. The increase in single stresses is such as to reduce the average life of the instrument, insofar as the effect of an overload depends both on its quantity, and its time duration. The increase in the components which tend to flatten the bottom and curve the top, intervenes also to modify the timbre."

As Professor Righini states in his book *Il diapason*, "the increase of 5 hertz is the equivalent of a proportional increase in the tension to which it corresponds, for the A string alone, an increase in pressure of about 900 grams. And since there are four strings on the violin, all of differing thicknesses and density, the overall increase in pressure can be estimated at 4 kilograms or a bit more." It turns out, moreover, that the oldest Cremona instruments were constructed for a tuning no higher than a middle C of 256 cycles (corresponding to the Verdi A), which is indicated by many as the "scientific diapason." The cited text of Righini states in this connection, citing the experiment carried out by the French physicist and taken up again by the Fronticelli-Baldelli stringed instrument makers: "The volume of air contained in the best Cremona violins (Stradivari and Guarneri) always had a frequency of 256 hertz (for C index 3, or Middle C). Savart's experiment was recent repeated on the famous Stradivari violin 'Il Cremonese' of 1715, kept at the City Hall in Cremona, and it fully confirms the hypothesis that this was the ideal tuning for stringed instruments: If one sings a series of notes in glissando into the violin's case, the greatest resonance is attained precisely at a middle C of 256 vibrations."

Additionally, the pianoforte, reports Professor Righini's book, suffers serious harm with the increase in tuning pitch: "Let us again consider an increase of 5 hertz above the normal tuning," writes Righini. "The increase in pressure owing to this increase is enormous, in the order of tens of kilograms.



These wonderful old instruments were built to approximate the qualities of the human voice. Above is a Guarneri violin, built at Cremona in 1708. Below is a soprano lute of the 16th century.



Milan, Castello Sforzesco

What the consequences of this are, can be said by piano builders. We cite in this connection the opinion of European, the association of almost all the European builders: It is absolutely negative, since, relatively recently, the technicians of one of the biggest factories in the world expressed their disappointment about the "ill effect which three concert grand pianos received as a consequence of the demands of a very well known orchestra director to have them tune to $A = 445$ Hz." Needless to say that the fortepianos, which do not even have the metal framework of a pianoforte, are not only damaged, but they cannot support a tuning higher than 432 cycles, as reported by fortepiano experts at the Deutsche Museum in Munich in Bavaria, in which many antique instruments are kept, among them Italian ones.

Also many antique organs, according to the testimony of numerous organists and organ restorers, do not hold up to arbitrary increases in tuning, insofar as many antique organs, particularly in Italy, were built for a tuning no higher than $A = 435$. Thus Prof. Egidio Circelli, organ instructor at the Pontifical Institute of Sacred Music, complains of grave problems in the performance of works for organ and orchestra, when the orchestra is tuned too high. The old organ cannot cut its pipes to adapt.

The only instruments which do not appear to suffer immediate harm are the winds. Many wind instruments underwent changes at the end of the 19th century, when the race

toward high tuning began at the initiative of the Russian and Austrian military bands and of Richard Wagner, who personally went to many wind instrument builders to obtain higher instruments, with the idea that the sound of the winds should prevail over the other instruments and the voices. It is no accident that one spoke of the decree of Verdi and the Italian musicians as the "war of the uvulas against the brasses." Even so, the Orsi Company of Milan, to which the War Ministry in 1884 entrusted the job of changing all the wind instruments in the Italian military bands to the new tuning (A=432), complains in a letter sent to the Schiller Institute immediately after the April 9, 1988 conference, that the modern tendency to order wind instruments which are tuned higher and higher, makes it impossible to hold even the A=440 tuning established by convention and respected by no one, perhaps because of the very fact that it is only a conventional measure. According to the Orsi firm, it is completely feasible to build wind instruments tuned to Verdi's concert A, and the molds still exist; what counts, for winds as well as for the other instruments and the voice, is to establish one tuning and stick to it.

The argument raised in 1983 by Senator Valitutti, then chairman of the Education Committee of the Senate, according to which it is not possible to regulate and unify the tuning of orchestras because Article 33 of the Constitution establishes that "art and science are free," does not take into account, therefore, that the increase in the tuning pitch denies the freedom to faithfully render the compositions, and infringes upon another article of the Constitution, Article 9, according to which the Republic "safeguards the landscape and the historic and artistic patrimony of the Nation."

4. The alteration of the musical language

As Maestro Arturo Sacchetti was correct to note in his speech to the conference of April 9, from the standpoint of the orchestral conductor, the major damage caused by the high tuning is that suffered by the composition itself, whose key becomes distorted. The alteration of the musical language which derives from this is an indication of a musical immorality which it is time to remedy. All the greatest composers selected, in fact, the keys of their works by taking account of the difference of color between one key and another, and they speak expressly of this in their letters and their writings. The moment one starts from an A which is a half-tone higher than that desired by the composer, one has arbitrarily transposed the entire composition by a half-tone. The best orchestra conductors develop an ear for the



Arturo Sacchetti

right natural key, and realize if it is not respected. In his report to the Milan conference, Maestro Sacchetti traced some personal deductions, stemming from his experience as orchestra and choral director, which will be useful to report on this occasion:

a) Why the pitch has gone crazy

- 1) Search for a greater brilliance of sound by raising the tuning;
 - 2) Harshening of the dynamics;
 - 3) Change of the agogic;
 - 4) Lack of professional ethics and of artistic conscience.
- To quote from the administrative director of one of the most famous European orchestras: "Man aspires to the heights, and each wants to surpass his neighbor."
- 5) Deplorable slovenliness of the standards of musical "hygiene";
 - 6) Overheated concert halls.

b) The consequences

- 1) Irreversible and incurable damage to the historical instrumental patrimony which cannot endure the raising of the pitch;
- 2) Accentuation of the strain on singers and consequent physical damage to the vocal mechanism, as well as the human body;
- 3) Tensions and harsh sounds which deform the perceptions of the ear and damage the hearing organ itself;
- 4) Total impossibility of respecting the creative intentions of the composer expressing a historical tuning;
- 5) Inability to realize a blending of voices and/or instruments;
- 6) Relation of unacceptable intonation in the matching of orchestra instruments to instruments with fixed tuning (organ, pianoforte, harpsichord);
- 7) Reciprocal infection between voices and instruments fraying from the anti-musical shrieks, brutal sonorities, heaviness, coarseness, and vulgarity;
- 8) Unstoppable acceleration of tempi owing to the sound being augmented by the raised pitch. It is natural to speed up the tempo in "forte";
- 9) Empirical transpositions of sections of compositions, involving above all the solo voices, which find themselves in opposition to the general coherence of tonal structure;
- 10) Anomalous strains for vocalists faced with orchestras which are stretched up to frequencies impractical for the vocal organ;
- 11) Progressive impracticality of performing some compositions due to the presence of extreme tessituras which the voices cannot reach.

c) The responsibility

- 1) The professionals, lacking artistic morality (orchestra directors, professors, artistic directors, etc.);

2) Leaders of agencies and institutions;

3) Ministry of Tourism and Entertainment (does not enforce the provisions contained in the Dec. 17, 1936 law, no. 2440, art. 3: "Every authorization and every subsidy granted by the State to a public corporation for management of opera and concert performances, and for the formation of choral, band, and orchestral groups is conditioned also by the observation of the preceding regulations, a tuning fork of 435 Hz at the temperature of 15° Centigrade);

4) Minister of Public Instruction (non-observance of the Oct. 30, 1887 law, no. 5095, tuning pitch of 435 Hz at a temperature of 20° Centigrade).

In the book *Tullio Serafin: il patriarca del melodramma* (*Tullio Serafin: The Patriarch of Opera*), the great orchestra director takes up the theme of the tuning pitch, declaring among other things: "For many years the tuning of Italian orchestras has been for me a source of anxiety. I ascertained, in fact, that there was a tendency to keep the pitch high, and that a fashion had been established among the various orchestras, a real race to the heights. My anxiety derived from the awareness of the damage that would be done to the voices. I do not refer to single high notes, in isolation, which a good singer is always able to launch; I refer to the continuity of certain semi-high and high tessituras, which under conditions of a high tuning pitch put the performer in difficulty, with grave damage to his vocal apparatus. I was told that with the high pitch, the orchestra sounds more brilliant. I reply that the brilliant sound is desirable, as long as we don't exaggerate, otherwise it becomes shrill and takes on detestable colorations. . . . In 1885, the concert A was established at 435 vibrations; but I would like to remind everyone that according to Verdi's opinion it should have been lowered to 432 vibrations."

Today, Maestro Gianandrea Gavazzeni is of the same opinion; he states that "the high tuning of today makes the correct interpretation of the entire repertory of the 1800s, written for a much lower tuning, impossible, and causes serious damage not just to soloists' voices, but also to the entire choral framework."



Gianandrea Gavazzeni

5. Physical aspects

It has been said several times in this report that by "scientific standard pitch," is meant a standard pitch corresponding to a Middle C of 256 cycles per second (and equivalent to an A between 430 and 432 cycles, depending on whether one uses the Keplerian or the Pythagorean scale to calculate the correspondence between Middle C and A, index 3). The

Italian scientists who proposed this "scientific tuning pitch" to the Congress of Musicians held in Milan in 1881, and leading into the decree of 1884, justified their choice in this way, as the "Acts of the Congress of Milan" kept at the G. Verdi Conservatory document:

"The greatest physicists always proposed its adoption; and from 1700 on, Sauveur proposed the C of 256 vibrations as the immutable normal type of tonality in musical sounds. Chladni in his *Treatise on Acoustics*, and Prony in his *Elementary Instruction on the Mode of Calculating the Musical Intervals*, approve those theories. Rudolph Koenig, celebrated builder of physical apparatus, warns all those who 'wish to honor him with their orders, that he has taken as his point of departure, in the construction of the acoustical instruments brought together in his catalogue, the standard pitch of C=256 vibrations, first proposed by Chladni, as producing for every C, numbers which are powers of 2, which makes it very convenient to use."

"According to Meerens," reported the scientist Archimede Montanelli to the 1881 congress, "the only scientific tuning fork is the one that starts from the simplest numerical ratio of 2, 4, 8, 16, up to 256 (C index 3) [Middle C], a number which, according to this reckoning: $27/16 \times 256$, gives the A (index 3) [concert A] to the above-cited 432 vibrations per second."

To the physical observations of the Italian, French, and Belgian scientists who officially proposed C = 256 vibrations as the scientific tuning pitch, today are added the new astronomical discoveries carried out by studying Kepler by the American scientist Jonathan Tennenbaum, who presented them as follows to the Schiller Institute conference:

"C = 256 has a uniquely defined astronomical value, as a Keplerian interval in the solar system. The period of one cycle of C = 256 (1/256 of a second) can be constructed as follows. Take the period of one rotation of the Earth. Divide this period by 24 (= $2 \times 3 \times 4$) to get one hour. Divide this by 60 (= $3 \times 4 \times 5$) to get a minute and again by 60 to obtain one second. Now divide that second by 256 (= $2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$). These divisions are all Keplerian divisions derived by circular action alone. It is easy to verify, by following through the indicated series of divisions, that the rotation of the Earth is a 'G,' 24 octaves lower than C = 256! Similarly, C = 256 has a determinate value in terms of the complete system of planetary motions."

The coherence between the planetary order and the correct tuning for the human voice is dictated in the first place by the fact that "the human voice is a living process. Leonardo da Vinci and Luca Pacioli demonstrated that all living processes are characterized by a very specific internal geometry, whose most direct visible manifestation is given by the morphological proportion of the Golden Section, which is also reflected in the fundamental intervals of the well-tempered scale."

For this reason, and on this the scientists and the musi-

cians of the 1700s, the 1800s, and the 1900s concur, the choice of the tuning must be based on the laws of the human voice.

6. An international panorama

Hundreds of singers, instrumentalists, orchestra directors, and opera lovers have signed the petition circulated internationally by the Schiller Institute for Italy and the entire world to return to the scientific tuning fork of Verdi (C = 256 vibrations, corresponding to an A of 432 vibrations).



Giuseppe di Stefano

Among the most famous signers we recall on this occasion Renata Tebaldi, Piero Cappuccilli, Mirella Freni, Ruggero Raimondi, Fedora Barbieri, Giuseppe di Stefano, Gianandrea Gavazzeni, Luciano Chailly, the famous Swedish soprano Birgit Nilsson, together with tens of singers from the Stockholm, Oslo, and Copenhagen opera houses, among them the daughter of the famous Swedish tenor Jussi Björling, tens of singers and instrumentalists of the Metropolitan Opera of New York, including soprano Bidu Sayao and the first violoncellist of the Metropolitan Jascha Silberstein, the famous German tenor Peter Schreier, who highlighted particularly the problems created by high tuning for the interpretation of German *lieder*. But also hundreds of singers, teachers of singing and musical instruments, and opera devotees have joined their appeal throughout the world. Even in Brazil, last year a commission was formed to study a change in the tuning.

The press has also concerned itself with this topic. The *New York Times* wrote, some months back, that "it is very common today to listen to an instrument composition of Mozart in the original tuning, but at the opera, no one thinks of giving the singers the same advantage. Perhaps it is time that the musicologists and antique instrument experts embrace the cause of the oldest and most authentic instrument: the human voice. Adelina Patti (who fought at Covent Garden to return to the low tuning) would thank them." As the Italian and French newspapers wrote on April 26, therefore "the war of the tuning forks has been born, while the Italian government has been requested to pass a law fixing the A at 432 full cycles. The experts hope that this rule will be adopted in the whole world."

The bill which follows has been taken in large measure, excepting the pitch set at 432 vibrations, from Bill No. 296 of the IX Legislature [in 1983], sponsored by Senators Mascagni, Ulianich, Boggio, Panigazzi, Ferrara Salute, and Parrino. Special thanks go to Prof. Pietro Righini for the contribution made in the course of many years of study of the question of tuning pitch.

The Bill

Article 1

The sound of reference for the basic tuning of musical instruments is the note A (index 3), whose pitch must correspond to the frequent of 432 hertz (Hz), measured at a room temperature of 20° Centigrade.

Article 2

It is obligatory for institutes of musical instruction, for institutions and organizations in any way subsidized by the State or by public agencies, which run or use orchestras or other musical ensembles, and to the concessionary agency of public radio and television service, to consistently adopt as the reference sound for intonation, the note A (index 3) as in the previous article. Exemptions may be granted for exigencies of artistic research, except for passages of vocal music or opera performances.

Article 3

To comply with what is disposed by the foregoing articles it is obligatory to use practical reference instruments for intonation (tuning forks, metal rulers, plates, electronic generators, etc.) which are calibrated to the frequency of 432 hertz and endowed with the relevant mark of guarantee, indicating the prescribed frequency. A tolerance above or below this of 0.5 hertz is allowed.

Article 4

Contributions by the States and by public entities are also conditioned by the proven observances of the standards contained in the present law.

Article 5

The utilization of instruments of reference not conforming to the standard of the above Article 3 is punished with the confiscation of the non-standard object and with a fine for each specimen of between 100,000 and 1,000,000 liras [approximately \$73-730—ed.].

Article 6

The specialized institutes authorized to supply the sample frequency for calibrating the reference instruments and to exercise control functions, will be indicated by a decree of the Ministry of Public Instruction.

Article 7

The Ministry of Public Instruction, in concert with the Ministry of Tourism and Entertainment, shall take measures the term of one year to issue the code of enactment of the present law.

Article 8

All preexisting laws on this matter are abrogated.