Luigi Russolo

The Art of Noises

by Luigi Russolo

Translated from the Italian
With an Introduction by Barclay Brown

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Contents

Introduction

The slim volume of essays presented here for the first time in English translation is one of the significant documents of musical aesthetics of this century. If the book itself has remained the province of a mere handful of readers, its ideas, passed on through a variety of later musical and literary movements, became the inspiration for some of the most innovative artistic creations of modern times. Writing in 1916 (many of the essays appeared even earlier) Luigi Russolo anticipated—indeed, he may have precipitated—a whole range of musical and aesthetic notions that formed the basis of much of the avant-garde thought of the past several decades.

The doctrines of *musique concrète* find their first expression in Russolo's opening manifesto (from March 1913) which envisions entire symphonies composed of the sounds of everyday urban life. Russolo's awareness of the sea of sound in which we live, his consciousness of the expressive musical possibilities of noise inevitably link him with such contemporary figures as Pierre Schaeffer and John Cage. Although Russolo's book was obscured by the turbulent cultural events of the following decades, the ideas that it expounded were not. Those ideas were absorbed, modified, and eventually transmitted to later generations by a number of movements and individuals—among them, the futurists, the dadaists, and a number of composers and writers of the nineteen-twenties. The outbreak of *machine music* that characterized the middle years of the 'twenties can be traced directly to its beginnings in Russolo and the Italian futurists.

Equally important was Russolo's role in creating the first musical synthesizers. His *intonarumori*, or noise instruments, could produce a variety of different timbres, some resembling the sounds of nature or machines, some entirely new. More significantly, these timbres could be produced over a range of different pitches, sometimes more than two octaves. Many of these timbres bore a distinct likeness to those produced by an electronic synthesizer. The likeness was compounded by the fact that Russolo used his instruments as the basis for essentially abstract musical compositions, much like the electronic music of today.

The Art of Noises presents a new musical aesthetic, an aesthetic so audacious for its time that Russolo's contemporaries (including even Igor Stravinsky) considered him merely an amusing eccentric. Yet his thesis was logical enough. If music is sound, why does not music employ all the varieties of sound? Why cannot music embrace sounds like those made by people and animals, the sounds of nature, the sounds of a modern industrial society? Thus, Russolo projected a music that would be compounded of the innumerable sounds of human existence, "... the muttering of motors that breathe and pulse with an undeniable animality, the throbbing of valves, the bustle of pistons, the shrieks of power saws, the starting of a streetcar on the tracks, the cracking of whips, the flapping of awnings and flags."

Russolo's thesis had found its source in the doctrines of F.T. Marinetti, whose *Manifesto of Futurism* had appeared on the front page of *Le Figaro* a few years earlier. Marinetti's manifesto had proclaimed a total revision of aesthetic values. Cries like "Burn the museums" and "Flood the libraries" bristled from its pages, declaring both its militancy and its scorn of the past. Two years before Russolo's publication, Marinetti had taken the liberty of inserting into Balilla Pratella's *Technical Manifesto of Futurist Music* a passage that clearly prophesied Russolo's own manifesto. "It [music]," the passage read, "must represent the spirit of crowds, of great industrial complexes, of trains, of ocean liners, of battle fleets, of automobiles and airplanes. It must add to the great central themes of the musical poem the domain of the machine and the victorious realm of electricity."

If the theme of machine and technology was not entirely new with Marinetti, his methods of molding the theme into a modern poetical form definitely were. Within a few years of the publication of his original manifesto, he had invented the new poetical technique that he called *free words* (*parole in libertà*). Conceived during his activities as a correspondent in the Libyan War, his *free*

words were essentially an attempt to liberate the sounds of poetry from the restrictions of syntax and grammar. His primary tool for achieving this end was the onomatopoeia—the free onomatopoeia. The noises of machine guns, bombs, and shrapnel became new words in a complex poetical vocabulary. A breathless use of language injected new rhythms and variety into the aural element of poetry. Set in a poetical context that largely disdained the conventions of syntax, that used verbs only in the infinitive, that required nouns to fill the role of adjectives, even Marinetti's earliest efforts in the new idiom managed to portray vividly the turmoil, speed, and confusion of modern warfare.

By the time of Russolo's manifesto, then, Marinetti had already conceived and put into practice the idea of "noise as poetry." Nor can there be any doubt that Marinetti's ideas were instrumental in shaping the writings of Russolo. In either case, however, the manifesto itself was only a statement of principles, dependent for its realization upon the development of personal artistic techniques. For Marinetti, this had meant the discovery of a new poetical language. For Russolo, it meant the creation of a new model for musical sound—and the construction of an entire orchestra of incredible instruments with which to realize that model.

Russolo had not been trained as a musician. He had joined Marinetti's futurist movement as a painter in 1910, along with his better-known companions Umberto Boccioni and Carlo Carrà. Indeed, he had hardly been trained as a painter, since most of his knowledge of that subject had been gained through his association with art students at the Brera in Milan. His grasp of music, such as it was, had been gleaned from his father (an amateur church organist) and from his brothers Giovanni and Antonio, students at the Milan conservatory. Still in his 28th year at the time of his original manifesto, he had pursued a variety of artistic occupations through the years: designer of theatrical costumes, restorer of Renaissance paintings, free-lance engraver, and finally, futurist painter.

Undoubtedly, it was Russolo's association with Marinetti that had planted the seed of the new aesthetic. The sudden conversion from painter to musician, however, can be explained only by Russolo's all-consuming belief in his new vision. Overnight, he abandoned painting to devote his entire energy to the creation of his noise instruments. It was a change that was to last for the next twenty years of his life.

The astonishing speed with which Russolo constructed the new instruments is testimonial not only to the force of his vision but also to his impressive mechanical talent. Starting from the various "families" of noises outlined in the manifesto, he quickly established mechanical means of producing noises reminiscent of each (roars and booms, whistles and hisses, etc.). The problem of varying the pitch of the noises seems to have been solved even before the manifesto was published. Although Russolo spoke of the "extreme simplicity" of the instruments, the statement should not be taken too literally. The later instruments show many complex details.

Russolo's work was undoubtedly facilitated by Marinetti's help and encouragement. Not only did Marinetti publish the original manifesto, it is probable that he aided Russolo in its preparation. It seems likely, too, that he supplied a portion if not the major part of the funds necessary for the project. Indeed, he continued to give Russolo various financial assistance for many years to follow.

By the beginning of April, the first of the instruments was ready for a public demonstration at Modena. The instrument, a *burster* (*scoppiatore*), produced a noise similar to that of an early automobile engine. According to Russolo, the noise could be produced throughout the range of "ten wholetones," including all intermediate microtones. The instrument seems to have been greeted with a mixture of serious consideration and raucous derision.

By the time of this demonstration, three other instruments were almost completed. They included a *hummer* (which sounded like an electric motor), a *rubber* (with a metallic scraping sound), and a *crackler* (somewhat like a cross between a mandolin and a machine gun).

Barely two months later, an audience invited to Marinetti's home in Milan, could hear sixteen such instruments in a performance of two compositions written by Russolo himself, *Awakening of a City*, and *Meeting of Automobiles and Airplanes*.

Guests at the event included a number of press representatives, among them an anonymous correspondent of the London *Pall Mall Gazette*, who later published an account of the gathering. His description of Russolo's first composition, *Awakening of a City*, provides a glimpse of the strong impression that this first concert must have made upon its listeners:

> "At first a quiet even murmur was heard. The great city was asleep. Now and again some giant hidden in one of those queer boxes snored protentiously; and a new-born child cried. Then, the murmur was heard again, a faint noise like breakers on the shore. Presently, a far-away noise rapidly grew into a mighty roar. I fancied it must have been the roar of the huge printing machines of the newspapers.
>
> "I was right, as a few seconds later hundreds of vans and motor lorries seemed to be hurrying towards the station, summoned by the shrill whistling of the locomotives. Later, the trains were heard, speeding boisterously away; then, a flood of water seemed to wash the town, children crying and girls laughing under the refreshing shower.
>
> "A multitude of doors was next heard to open and shut with a bang, and a procession of receding footsteps intimated that the great army of bread-winners was going to work. Finally, all the noises of the street and factory merged into a gigantic roar, and the music ceased.
>
> "I awoke as though from a dream and applauded."[1]

This first concert of Russolo's instruments was apparently a trial run, intended to gather reactions to the new art. Even Marinetti admitted "a certain inexperience on the part of the performers, insufficiently prepared by the small number of rehearsals."[2] This was seemingly the only occasion on which Russolo allowed his listeners to view the interior of his instruments. According to the *Pall Mall Gazette* reporter, the instruments contained "drum skins, wooden disks, brass plates or bagpipes, all set into motion by handspikes."[3]

Some eight months were to pass before the riotous public concert given at the Teatro Dal Verme on April 21, 1914. This concert and the short-lived concert tour that followed are described in Russolo's second chapter.

Shortly thereafter World War I erupted across Europe, eventually dragging Italy and Russolo into the fray. Wounded in the battle for Monte Grappa at the end of 1917, Russolo received a life-long pension from the Italian government. From occasional notices in Italian newspapers of the time, it is apparent that he continued his musical activities after his discharge from the Italian army. For the most part, however, details of those activities are lacking.

[1] *Pall Mall Gazette* (London), November 18, 1913.
[2] From an announcement published in the *L'Hérault Beliers*, October, 1913.
[3] *Pall Mall Gazette*, November 18, 1913.

Russolo's next large venture was a series of concerts presented in Paris at the Théatre des Champs Elysées in June of 1921. The event seems to have been occasioned by Marinetti's resentment of the growing success of Dada in Paris. It is doubtful that Russolo himself could have financed the three concerts. The presence of Tristan Tzara and other dadaists at the first performance on June 17th, moreover, aptly demonstrated their hostility. At the beginning of the concert they hurled forth catcalls and cries of "Kill it!" "Fi-Fi!" and so on. Marinetti had been forewarned, however, and Tzara and company were soon ejected by the gendarmes. The circumstance, plus Tzara's earlier confrontations with Marinetti, strongly suggest that Marinetti had brought Russolo and his instruments to Paris at his own expense as a deliberate challenge to the dadaists.

The program of the Paris concerts presented Russolo's instruments in the context of the conventional orchestra. Russolo had combined drums and other percussion instruments with his noise orchestra before. Balilla Pratella had even used the noise instruments in pieces for conventional orchestra. But for Russolo himself, this was a new venture. Perhaps he felt that the new instruments would be more acceptable in such a moderated environment.

The music for the concerts was composed by Russolo's brother Antonio and by another Milanese composer, Nuncio Fiorda. The full program is no longer extant, but the names of some of the pieces are known. Six of the pieces were written by Antonio Russolo: *Prelude, Intermezzo, Serenade, Chorale, Scherzo,* and *Finale*. Two others were supplied by Fiorda: *Cappuccino* and *Procession in the Rain*.

The *Serenade* and *Chorale* of Antonio Russolo still exist in a contemporary recording. The music is not especially memorable. The recording technique of 1921, moreover, gives only a hint of what Russolo's instruments—used for for the most part *en masse*—must have sounded like. Russolo himself did not seem greatly enamoured of the effects produced by the combination of noise instruments and conventional instruments. He says as much in Chapter X of the present treatise. He reaffirmed these views later in private letters.

The Paris concerts seem to have achieved something of the desired result. They once again attracted professional attention to futurist music. Also, they provided Russolo with a strong impetus to continue his work as a maker of avant-garde instruments.

In the fall of 1922, the instruments once more drew notice for their use in the production of Marinetti's play *Fire Drum* at the

National Theater in Prague. Balilla Pratella had written the music for the presentation, and at Marinetti's inducement, he seems to have included Russolo's instruments in some of the music. The primary use of the instruments in Prague, however, was for the production of various sound effects, a use that Russolo was later to follow up in connection with silent movies. The management was so impressed with their effectiveness that it commissioned Russolo's colleague, Ugo Piatti, to reproduce twelve of them in the theater's workshop.

Russolo, meanwhile, his government pension constantly dwindling under the pressure of inflation, had taken a position as a supervisor in the construction of an aerial railway at Thiene in the mountains of northeast Italy. He was thus unable to participate in the Prague production. At that very time, however, he was already planning the construction of a new instrument that would combine several of the earlier ones in a single device that could be played by one performer.

The construction of the new instrument, which he called the "noise harmonium" (*rumorarmonio*), was completed by April of the following year (1924) when he returned to Milan. In the succeeding months, he built a companion instrument, so that by the end of November he was able to demonstrate both of the new instruments at the first National Futurist Congress in Milan as part of a lecture entitled "The Unification of the Noise Instruments in the Noise Harmoniums (5 keyboards, 8 timbres)."

During this period, Russolo hoped that Marinetti might sponsor a tour of America for him and his instruments. This hope eventually came to nothing, as did similar plans for a tour of Holland. It was over a year before Russolo presented another public concert at the Teatro del Popolo in Milan (December 27, 1925).

The concert introduced still another instrument of Russolo, the *enharmonic bow*. The enharmonic bow was a metal rod with periodic indentations or grooves. This saw-like device could be used to bow the strings of a violin or cello, producing an unusual sound that somewhat resembled a guitar or a mandolin. The young Milanese composer, Franco Casavola, arranged some of his own music to be played with enharmonic bow on the occasion. His Intermezzo for cello and piano still exists. Still other pieces of Casavola may have been played by Russolo and Virgilio Mortari on the noise harmoniums.

Little is known of Russolo during the next year. About this time he married Maria Zanovello, a teacher of French at a Milanese *liceo*. A this time, too, he completed the most impressive of his instruments, a single noise harmonium that could produce the timbres of all his earlier instruments.

This new instrument was formally presented in Paris, where Russolo participated in the production of the Futurist Pantomime Theater at the Théatre de la Madeleine in May and June of 1927. Russolo himself played the instrument, which had been hastily rebuilt after an accident during its shipment to Paris. On May 12th, a public demonstration of both the new noise harmonium and the enharmonic bow was given at the theater, with introductory remarks by Marinetti. Russolo's part in the production itself was apparently limited to providing the noise-music background for Prampolini's mime-ballet, *Santa Velocità*, although he is also mentioned as one of the conductors for the show.

At the end of June, shortly after the production at the Théatre de la Madeleine had closed, Russolo presented another demonstration concert, at the Sorbonne. In a letter to his wife, dated July 1, 1927, Russolo described the concert as "a real and personal triumph." The program consisted of Russolo's improvisations with the enharmonic bow and on the noise harmonium, some pieces by his brother Antonio, and four songs arranged for noise harmonium and voice by Casavola. Russolo was not entirely pleased. The arrangements of Casavola, he complained, were too romantic and sentimental:

> "... The conclusion that I drew is that where I made less music, in the old sense of the word, I had the greatest success!—and where the noise harmonium was used more. And everything that I have said confirms this opinion.
>
> "The musicians who continue to write for me need to persuade themselves of this and be less conventional. Or else I, who know nothing of music, will write it myself, with the same novelty that the novelty of the instrument requires."

The Sorbonne concert marked a turning point in Russolo's career. Although his immediate move was to return to Milan, where he set to work at once on the fourth and final version of the noise harmonium, he had clearly decided to seek his fortune in the stimulating atmosphere of Paris. During the next six years of his life, he was to become a kind of intellectual vagabond, braving all sorts of hardships and poverty in his search for recognition and financial success.

His return to Paris in the fall of 1928 began with a frenzy of

activity. Success seemed just around the corner. Parisian newspapers ran articles on him and his instruments. Fox Movietone offered to make a short sound feature of his noise harmonium. Bankers and financiers expressed interest in manufacturing and marketing the instrument. The noise harmonium was in great demand at Studio 28 for accompanying silent movies. Russolo might have predicted that his fortune was made.

Fate, however, was not so obliging. The novelty of his instruments was soon exhausted. As sound films became more common, their potential for use in silent movies became less promising. Would-be financial backers grew scarcer and more cautious. There were ever fewer opportunities for Russolo to play his instruments for profit.

At the same time, prices in Paris continued to climb. Russolo, who was largely dependent on his soldier's pension and on gifts from his wife, soon began to borrow from his Parisian acquaintances. He thought of returning to painting but lacked the funds for supplies and a studio. He began to haunt certain cafes, where he eked out extra funds as a fortune teller and palm reader.

By the spring of 1929, he wrote to his wife that

> "... I am usually always more hungry than thirsty! For some months I have not gone to eat in any restaurant, no matter how inexpensive! I always eat in the room, and my meal (only one a day) is such a tiny thing that it is a miracle that I am still well."[4]

As his fortunes and his funds dwindled, Russolo chanced to meet a young Italian student named Guido Torre. Torre was an avid disciple of yoga. He seems to been a potent influence in Russolo's fervid acceptance of mysticism. Russolo's involvement with spiritualism and mysticism soon produced an extreme change in his activities and lifestyle. He practiced daily meditation and became a virtual recluse. A strong believer in psychic phenomena, he would be claiming in the next few years to effect miraculous cures through his powers as a magnetist.

There was also another side to his life. Paolo Buzzi paints a picture of Russolo surrounded by admiring conservatory students in the small cafes of the Latin Quarter of Paris.[5] Russolo is known to have

[4]Russolo, letter to Maria Zanovello Russolo, May 11, 1929. This and other letters to his wife are now in the possession of his nephew, Bruno Boccato.

[5]Maria Zanovello Russolo, *Russolo: L'Uomo, L'Artista* (Milan, 1958), p. 12.

become an acquaintance of Edgard Varese and other French intellectuals during this period. At this time, too, he conceived still another new instrument, the "enharmonic piano."

The spring of 1933 found him at Tarragon in Spain, where, as he wrote to his wife, he had become "a veritable solitary elephant." He returned to Milan the following year. A short time later, he and his wife retired to a small cottage in Cerro di Laveno on the southern shore of Lago Maggiore.

In the years before his death in 1945, Russolo finally returned to painting—though with nothing like the success of his earlier years. His monastic habits continued. Russolo occupied the attic of his little cottage, while his wife was restricted to the first two floors. His daily meditations, his strong beliefs in the mystical and the otherwordly persisted. These beliefs he later embodied in a theosophical book, *Al Di Là Della Materia* (*Beyond the Material World*, 1938).

With the exception of a model of the working parts of the enharmonic piano, an instrument that was never completed, none of Russolo's noise instruments have survived. Indeed, the instruments have simply vanished, apparent victims of the last World War. In most cases, not even the details of their disappearance are known. Thus, major portions of the present treatise are addressed, so to speak, to a cause that no longer exists. Russolo's elaborate descriptions of the timbres and capabilities of the instruments are shadowy evocations of a lost reality. His careful avoidance of technical details (he hoped to patent and market the instruments) seems designed to ensure that his creations will remain shrouded in mystery.

As always, however, the past has left its traces. In the spring of 1913, flushed with his success in creating the first noise instrument and not yet foreseeing the need for secrecy, Russolo revealed the basic mechanism of pitch control in his instruments in a short article published in *Lacerba*. Later, he photographed the interior of the instruments. In addition, patents were made for several of them. Letters and other articles have disclosed still more details of their construction.

Thus, whatever technical details of the instruments may be lacking, the basic principles on which the instruments were constructed are nonetheless clear enough. Each instrument comprised 3 mechanisms, a device to amplify the sound and control the pitch, a mechanism to generate the particular noise produced by that instrument, and a mechanism to provide the power or motion

of the noise-generating parts. The majority of instruments seem to have employed the same means of amplification and pitch control. The noise-generating devices, on the other hand, were quite various, although some instruments applied the same principle of generation in different ways to produce very different noises. The powering mechanisms were of three different types: a hand-driven device of some sort, an electric motor, and in one instance, apparently a hand-powered bellows.

Russolo clearly described the pitch-control mechanism to all of his instruments in the article from *Lacerba* mentioned above:

> It is enough to say that a single taut diaphragm suitably placed gives, by variation of its tension, a gamut of more than 10 whole tones, with all the passages of semitones, of quarter-tones, and also smaller fractions of tones.
>
> The preparation of the material for this diaphragm by means of special chemical baths varies according to the timbre of noise that one wishes to obtain. Then, by varying the means of excitation of the same diaphragm, one can also obtain a different noise, *in type and in timbre*, always preserving naturally, the possibility of varying the tone [pitch]. . . [6]

Photographs of the interior of Russolo's instruments show that the "diaphragm" he describes is a kind of drumskin, actually mounted on a drum frame. A wire attached to the center of the skin allowed it to be pulled to the desired tension, with the resultant change of pitch. In most cases, the wire also served to transmit the specific noise of the instrument to the skin itself, where the larger surface acted as a sound board. In one instance in the instrument called the whistler (*sibilatore*) the tension of the skin was changed instead by a metal roller whose pressure increased as it moved toward the center.

Less is known of the sound-generating mechanisms of the instruments. For the most part, Russolo left no detailed descriptions of the mechanisms. Thus, the particulars of their construction must be hypothesized from two remaining photographs, from various casual statements made in articles and letters, from principles revealed in two patents, and from the statements of the few persons who glimpsed the interiors of the instruments. While the following

[6]Quoted from Michael Kirby, *Futurist Performance* (New York, 1971), pp. 176-7.

descriptions are hypothetical, they do rely exclusively on principles of sound generation that Russolo is known to have used. A degree of confirmation of these hypotheses has been found in attempts to reconstruct the instruments: the reconstructions have produced noises substantially in accord with the descriptions left by Russolo.

Altogether, Russolo's instruments included twelve different systems of noise generation, each producing a highly characteristic timbre. Since the Art of Noises discusses only nine of these instruments, a complete list is given below:

1) The howler: a noise somewhere between that of a traditional string instrument and that of a siren
2) The roarer: a rumbling noise in the low-pitched instruments; not clearly described in the higher instruments
3) The crackler: a metallic crackling noise in the high-pitched instruments; a strident metallic clashing in the lower ones
4) The rubber: a metallic scraping or rubbing sound: less forceful than the sound of the preceding instruments
5) The hummer: a noise resembling the sound of an electric motor or the dynamos of electric power plants
6) The gurgler: a noise like that of water running through the raingutters of a house
7) The hisser: a hissing or roaring noise like that produced by heavy rain
8) The whistler: a noise like the howling or whistling of the wind
9) The burster (1): a noise like that of an early automobile engine
10) The burster (2): a noise like that of dishes or pottery falling and shattering
11) The croaker: a noise like the croaking of frogs
12) The rustler: a noise resembling the rustling of leaves or of silk

It seems likely that the first four instruments of the twelve, the howler, roarer, crackler, and rubber, formed a group that shared a basic mode of noise production, in which a wood or metal disk turned against the wire attached to the center of the drumskin.

A number of observations lead to this conclusion. First, Russolo himself stated in an unpublished article[7] that the roarer and the

[7]"L'Archet enharmonique de Luigi Russolo," pp. 2-3.

crackler shared the same principle of sound production with the enharmonic bow. The enharmonic bow, known from a patent that Russolo made,[8] was a metal rod with periodic grooves or indentations that was drawn across the strings of a traditional string instrument to produce a new timbre. Second, a photograph of the interior of one of Russolo's instruments shows a metal disk with such indentations on its rim: the disk turns against a wire that leads to the drumskin. Third, the anonymous correspondent of the London *Pall Mall Gazette* states that Russolo's instruments contained "wooden disks" and "brass plates." Finally, Russolo groups together the howler and the roarer, the crackler and the rubber as pairs of instruments identical in range. This similarity may well reflect a similarity in the method of sound production.

Experiments show that a wood disk with an even but roughened rim, turning against the wire that connects with the drumskin, produces a sound much like that which Russolo described for the howler. A wood disk with indentations produces a noise similarly matched to the description of the roarer. A metal disk with sharply edged teeth makes a noise like that of the crackler. A metal disk with shallow indentations produces a sound much like that which Russolo attributes to the rubber.

While none of these observations provide indisputable proof of the technical details of the instruments, they do indicate that close approximations of the noises described by Russolo can be produced with the means described. Equally important, the means are methods of sound production that Russolo is known to have used.

With the instrument called the hummer, there is no need for speculation. Russolo left a photograph of the interior of the instrument that is clearly labelled. Here a small steel ball mounted on a spring wire is made to vibrate against the drum skin. In Chapter IX, Russolo states that the vibration is produced by an electric motor, not visible in the photograph. The usual wire to change the tension of the skin is present, as well as a device to change the position of the steel ball as the skin expands, thus permitting it to continue vibrating freely.

If the location of the steel ball is changed, so that it vibrates against the wire instead of the drumskin, the noise that Russolo described for the gurgler is produced. It is a noise like the tinkling of water in

[8]Brevetto industriale N. 243592 (Rome, 1926).

the gutters of a house. As he stated in a letter to Pratella,[9] Russolo later combined the hummer and the gurgler into a single instrument, which could generate the two noises either separately or together, although the instruments produced the same pitch when playing simultaneously.

Another instrument contained within the same housing as the gurgler was the hisser. Russolo describes the hisser as a stop, or lever, that could be applied to change the noise of the gurgler. The stop added the hissing or roaring sound of heavy rain. Apparently, the sound was produced by moving a number of spring-like wires to rest against the drumskin. The wires were caused to vibrate by the same motor as the gurgler itself.

The hisser was also present in the instrument called the whistler. The whistler seems to have been among the most complex of Russolo's instruments. It is likely that a patent that Russolo made in France and Germany in 1920[10] actually shows a schematic version of this instrument. The instrument shown in the patent has three organ pipes of different lengths that can be telescoped simultaneously to lower the pitch of all three together. The pipes are tuned to the root, major third, and fifth. They are joined to a wind chest that is enclosed on one side by a drumskin. A metal roller is connected to the mechanism that telescopes the pipes in such a way that the roller exerts increasing pressure on the skin as the pipes grow in length.

The instrument was undoubtedly powered by a mechanical bellows; the bagpipes seen by early observers of the instruments may have served as the primary wind chest of the whistler. Russolo states that the instrument had two stops. One was the hisser. The other, which changed the noise from a distant howling to an intense shrieking, may have consisted of nothing more than a series of shutters, like those of the swell organ.

Little is known of the construction of the two instruments called bursters. Russolo stated, of course, that the burster employed the usual drumskin to determine the pitch of the noise; but he makes no mention of the method of sound generation. An article published in the London *Daily Chronicle* (November 18, 1913, perhaps by the same correspondent as that of the *Pall Mall Gazette*) does mention

[9]August 19, 1921 from Milan (now in the possession of Dr. Ala Pratella).
[10]French patent No. 539.010. In Germany, No. 338641.

"wooden disks that can be made to beat frantically against one another." Possibly this may have been the mechanism of the first type of burster, which produced a noise like that of an automobile engine. Henri Painlevé, who stored the noise harmonium in his studio for some years during the 1930's, recalled a noise like "the falling debris of dishes," produced by "cardboard cylinders."[11] The noise is clearly that of the second type of burster. Without further information, however, this fact is of little use.

Nothing at all is known of the mechanisms of the other two instruments of Russolo. Nevertheless, Russolo does describe the timbres of the instruments in the letter to Pratella already mentioned:[12]

> The croaker imitates the croaking of frogs. They are perfectly imitated. They compare magnificently with any other instrument, and at the same time, they always sound clearly. They are rather loud but of a full and harmonious timbre that is never disturbing. They are the instruments of which Ravel was especially enamoured. (As you know, he is going to include the noise instruments in his new compositions.) They are all four well advised, having the same quality. With them you can produce equally well staccatos, legatos, and cantabiles. They are perhaps the most beautiful of the noise instruments. . .
>
> Finally, the rustlers have the softest timbre of all the noise instruments, so soft that it is almost weak. They have a timbre like the rustle of silk, and still they sound—naturally in soft passages. For the rest, they have all the qualities of the croakers. Of course, I would not advise using them for melody too much, given the lightness of their sound, since they whisper more than they sing. . .

Of Russolo's other instruments, the most important was the noise harmonium, a unification of the twelve basic timbres within a single instrument that could be played by one performer. This unification must have required not only the miniaturization of some of the original instruments but perhaps the coupling of two or more of them to the same drumskin as well. The first noise harmonium, of which a photograph still exists, did not produce all twelve timbres.

[11]From a letter of Painlevé to the writer, dated January 23, 1975.
[12]This letter also describes a number of other instruments, including the howler, hummer, gurgler, whistler, and crackler.

The photograph shows that this early instrument had keys like those of the piano (a fact confirmed in some of Russolo's letters to his fiancée). The construction of a second noise harmonium (also with keys) increased to eight the number of timbres produced by both together.

Only with the third version of the noise harmonium, completed in 1927, were all twelve timbres produced on the same instrument. As Russolo related in an article in *Melos*,[13] this version of the instrument abandoned the use of keys to return to the pitch-control levers found in the first noise instruments. From his observation of the instrument in his care, Henri Painlevé confirms the fact that the fourth and final version of the noise harmonium also had levers (*touches*), "each lever provoking a different noise."[14]

With good reason, Russolo considered the noise harmonium the most significant of his instrumental creations. He frequently used the instrument to accompany avant-garde films at Studio 28 in Paris during the late 'twenties and the early 'thirties. It was through this instrument that the legend of Russolo lingered on in Paris long after his departure.

The enharmonic bow, as described before, was a slender metal rod with periodic grooves or indentations. The rod was set in a saw-like handle and drawn across the strings of a violin or cello. The pitch was determined not by the fingers of the left hand but by the position of the rod on the strings. As Russolo stated in an unpublished article,[15] the instrument was provided with a specially raised bridge and a fingerboard on which the position of the pitches were marked. The sound thus produced has been compared to a cross between a guitar and a mandolin. As one listener related, there was a constant "crackling" sound, like "telephonic interference."[16]

The slight personal recognition accorded Russolo by his contemporaries, and more importantly the almost complete lack of monetary reward, undoubtedly helped to cut short the career of one of the most ingenious inventors of this century. Had Russolo found the encouragement to continue his activities, he would surely have gone on to create still other new, startling, and unheard-of

[13]Melos (VII/1) January 1928, p. 14.
[14]Painlevé, letter of January 23, 1975 (cited above).
[15]Russolo, "L'Archet enharmonique."
[16]Review by Pierre Mundru, *Ruy Blas* (Paris), July 1, 1927.

instruments. Indeed, it seems to have been only the lack of funds that prevented him from doing so.

Among the personal effects left by Russolo, for instance, is a sketch for a patent of an organ pipe that could produce two different pitches simultaneously. Another patent for an "enharmonic piano" describes an instrument that is not a piano at all but rather an instrument in which the sound is created by rosined belts rubbing against metal springs. The springs could be depressed, thus changing their pitch. Had he been financially able, it seems likely that Russolo would have continued to pour forth new ideas and to enrich the world with his unusual instruments.

The disappearance of Russolo's instruments is a great loss. It would be interesting to hear what the instruments actually sounded like. It would be fascinating to recapture the sounds of those first noise-music concerts that so disturbed and intrigued their audiences. Yet, even if the instruments had survived, it is unlikely that they would evoke the same kind of interest today. The sounds of new instrumental techniques and of electronic synthesis have become so familiar that Russolo's instruments could hardly be expected to produce the same surprise and wonder that they once did. The idea of introducing the noises of automobiles and airplanes into music is by now well dated. Electronic instruments are capable of producing a far greater variety of timbre and dynamics.

Still, Russolo's creations served their purpose. They dramatized for an astonished world the emergence of a new musical aesthetic. They fostered a new idea of musical creativity, in which the composer could create his own timbres and designate his own pitches (and not just those indicated by conventional music notation). If the instruments did not survive, these ideas did. More than to any other individual, they owe their existence to the example of Russolo, which established the precedent, and thus eventually the intellectual atmosphere in which they could thrive.

Russolo's instruments grew out of the impetus of Marinetti's poetical technique called "free words"; and it is logical that they took the form they did. It was no coincidence that Russolo's first instrument was a burster, imitating the noise of an automobile. Had not one of Marinetti's earliest original poems been his "A mon Pégasse," devoted to the praise of his beloved 100-horsepower Isotta Fraschini? Marinetti's noise onomatopoeias were most frequently drawn from the machines of an industrial society and the machines of modern war. Thus, Russolo's instruments evoked the noises of automobiles, dynamos, train whistles, and machine guns. The titles of his first noise-music compositions, such as "Meeting of Automobiles and Airplanes" or "Skirmish at the Oasis" (never completed—but obviously suggested by Marinetti) plainly show the aesthetic origins of the instruments.

Because of these beginnings, Russolo is often associated with the so-called "machine music" that reached its heyday in the mid-1920's. Beyond doubt, his role in this trend is a vital one. His "Meeting of Automobiles and Airplanes" may be the very first piece that incorporates the sound of the internal combustion engine in music. Pratella's opera, *L'Aviatore Dro* (1915) again used Russolo's burster to depict the noise of an airplane engine—some years before the proposed use of such an engine in the Satie-Cocteau ballet, *Parade*. Indeed, the entire concept of machine music may go back to the early futurist manifestos of Russolo and Pratella.

Both Marinetti and Russolo, however, were painfully aware of the accusation that Russolo's first noise pieces were essentially imitative and associative in their musical concepts. In an announcement of the first noise-music concert at Marinetti's house in August of 1913, Marinetti took care to repudiate these accusations: "The four noise networks are not simple impressionistic reproductions of the life that surrounds us but moving hypotheses of noise music. By a knowledgeable variation of the whole, the noises lose their episodic, accidental, and imitative character to achieve the abstract elements of art."[17] Russolo writes a similiar repudiation at the end of the present work.

Marinetti later developed his free-words technique to the point of complete abstraction. Some of his poems use only invented "words," apparently lacking entirely in any denotative meaning. Russolo, too, felt the need for music more appropriate for his instruments, and after the invention of the noise harmonium, turned increasingly to improvisation.

It would be a mistake, however, to assume that the critics of the early noise pieces were correct in condemning them for their imitative content. The pieces had no written program, only suggestive titles. The description furnished by the *Pall Mall Gazette* correspondent seems to be personal fantasy. Unfortunately, it is impossible to appraise the music itself, since only two pages of the

[17] *L'Herault Beliers* (note 2).

scores appear to have survived. Even though Russolo was not trained as a composer—or perhaps because of it—it is entirely possible that the music had more value than his contemporaries recognized. The London correspondent's description of the music, in fact, gives the impression that its formal organization was similar to that of many avant-garde compositions today.

If these first pieces had dwelt on the futurist themes of technology and modern life, Russolo had assumed a broader outlook from the very beginning. His opening manifesto, with its six families of noises, embraces not just the noises of the modern world but all noises. Indeed, a number of his instruments produced noises reminiscent of natural phenomena, such as wind, rain, and thunder. Other instruments like the crackler or the rubber created sounds for which Russolo himself could find no analogy in existing noises.

The very act of constructing the instruments brought forth a new awareness of the nature of noises and of their complexity. Whether by chance or intent, the mechanism that Russolo selected to vary the pitch of his noises produced a continuous change of tension rather than discrete steps or stages. As a result, Russolo was forced to take account of microtones in his new music. Although his chapters on enharmonicism and its notation say little of the compositional potentialities of the new resource, they do make it clear that he actually employed microtones in these first pieces. Thus, Russolo was among the earliest musicians to put the often-discussed microtone to regular practical use.

Russolo's concerns, then, eventually came to take in much more than futurist doctrine. After the original noise music concerts, he seldom returned to the themes of technology and modernism in the music that he performed. The music written for him by his brother and others is almost entirely free of imitative usages. He himself turned increasingly to the technical and mechanical elements of his art; and it is in this that the real significance of his efforts lies.

Russolo's views looked forward to the time when composers would exercise an absolute choice and control of the sounds that their music employed. He was the precursor of electronic music before electronics had come of age. In this, he was virtually unique. No other musician of his time could have envisioned such a sweeping renovation of the materials of music.

There is no direct link between Russolo and the so-called "experimental music" that burst forth at the end of the second World War. Yet, there can be no doubt that Russolo's efforts exerted a strong influence both in the turbulent cultural events that preceded the war and in those that followed. Such composers as Leo Ornstein and George Antheil owed more to Russolo's example than they cared to admit. In the 1920's, the many mechanistic ballets and other instances of machine music could trace their ancestry directly back to the ideas that Russolo had advanced in 1913. There are other cases of Russolo's influence: the chorus of frogs near the end of Ravel's opera *L'Enfant et les sortilèges* was the direct result of his hearing Russolo's croaker. Such diverse composers as Arthur Honegger, Serge Prokofief, and Frederick Converse were eventually drawn into this circle of influence.

Russolo's ideas also produced a more subtle influence that derived from his association with Marinetti. The chief source of this influence lay in the affinity of noise music and noise poetry. During the closing years of the first World War, the nascent Dada movement in Zurich showed a special attraction to the Italian futurist movement. Tristan Tzara kept up a long correspondence with Marinetti, gradually introducing into Dada "concepts from Futurism which were to become central to the Dada canon, concepts such as 'simultaneity' and 'bruitism' or noise-music."[18] The early years of Dada were marked by its own version of noise music, which accompanied the many recitations and improvisations that nightly regaled the clientele of the Cabaret Voltaire. These years left their imprint on Dada as it spread abroad.

As Dada established itself, first in Paris and then in New York and Germany, it carried with it the kernels of the ideas that it had inherited from futurism. Such artists as Duchamps and Picabia painted mechanistic themes reminiscent of the early futurist shows in Paris. Others like Kurt Schwitters created long noise poems that had clearly found their impetus in the poems of Marinetti. And everywhere that Dada went, it carried with it the legend of noise music. Certainly, Dada eventually transformed the original futurist ideas into something quite distinct and individual (and it was Marinetti's failure to recognize this that caused the final rift between him and Tzara). At the same time, however, noise poetry and noise music had found a rebirth in Dada.

It was through the agency of Dada and related movements that the ideas of Russolo were transmitted to the future. However indirect

[18]Kenneth Coutts-Smith, *Dada* (London, 1970).

this link may have been, it helped to create the intellectual atmosphere that was to make possible such diverse phenomena as musique concréte, happenings, and electronic synthesizers. Russolo, in the meantime, had been forgotten. His part in helping to bring about this new world had been condensed to a few sentences in some books on 20th-Century music. His role was a vital one, nevertheless, and perhaps the revival of this volume will help to restore him to his rightful place in the history of present-day music.

The first chapter of the volume is a reprint of Russolo's 1913 manifesto. Chapters Seven and Eight are slightly revised versions of articles that Russolo had published in the Florentine magazine, *Lacerba*. Otherwise, the book seems to have been especially written for this 1916 edition. It has been out of print too long.

In making this translation, I have tried to follow Russolo's Italian as closely as possible. At times the difference between Russolo's long and flowing sentences and my own crabbed academese became too great, however, so that his sentences have been broken up into shorter ones simply for the sake of readability. For the most part, though, it is Russolo and not I who is responsible for the literary style.

Barclay Brown
August 12, 1983

The noise instrument laboratory in Milan, Luigi Russolo on the left, Ugo Piatti on the right.

CHAPTER ONE

The Art of Noises Futurist Manifesto

Dear Balilla Pratella, Great Futurist Composer,
In Rome, at the very crowded Teatro Costanzi, while I was listening to the orchestral performance of your revolutionary MUSICA FUTURISTA with my friends Marinetti, Boccioni, and Balla, I conceived a new art: The Art of Noises, the logical consequence of your marvelous innovations.

Ancient life was all silence. In the 19th Century, with the invention of machines, Noise was born. Today, Noise is triumphant and reigns sovereign over the sensibility of men. Through many centuries life unfolded silently, or at least quietly. The loudest of noises that interupted this silence was neither intense, nor prolonged, nor varied. After all, if we overlook the exceptional movements of the earth's crust, hurricanes, storms, avalanches, and waterfalls, nature is silent.

In this scarcity of *noises*, the first *sounds* that men were able to draw from a pierced reed or a taut string were stupefying, something new and wonderful. Among primitive peoples, *sound* was attributed to the gods. It was considered sacred and reserved for priests, who used it to enrich their rites with mystery. Thus was born the idea of sound as something in itself, as different from and independent of life. And from it resulted music, a fantastic world superimposed on the real one, an inviolable and sacred world. The Greeks greatly restricted the field of music. Their musical theory, mathematically systematized by Pythagoras, admitted only a few consonant intervals. Thus, they knew nothing of harmony, which was impossible.

The Middle Ages, with the developments and modifications of the Greek tetrachord system, with Gregorian chant and popular songs, enriched the musical art. But they continued to regard sound *in its unfolding in time*, a narrow concept that lasted several centuries, and which we find again in the very complicated polyphony of the Flemish contrapuntalists. The chord did not exist. The development of the various parts was not subordinated to the chord that these parts produced in their totality. The conception of these parts, finally, was horizontal not vertical. The desire, the search, and the taste for the simultaneous union of different sounds, that is, for the chord (the complete sound) was manifested gradually, moving from the consonant triad to the consistent and complicated dissonances that characterize contemporary music. From the beginning, musical art sought out and obtained purity and sweetness of sound. Afterwards, it brought together different sounds, still preoccupying itself with caressing the ear with suave harmonies. As it grows ever more complicated today, musical art seeks out combinations more dissonant, stranger, and harsher for the ear. Thus, it comes ever closer to the *noise-sound*.

This evolution of music is comparable to the multiplication of machines, which everywhere collaborate with man. Not only in the noisy atmosphere of the great cities, but even in the country, which until yesterday was normally silent. Today, the machine has created such a variety and contention of noises that pure sound in its slightness and monotony no longer provokes emotion.

In order to excite and stir our sensibility, music has been developing toward the most complicated polyphony and toward the greatest variety of instrumental timbres and colors. It has searched out the most complex successions of dissonant chords, which have prepared in a vague way for the creation of MUSICAL NOISE. The ear of the Eighteenth Century man would not have been able to withstand the inharmonious intensity of certain chords produced by our orchestra (with three times as many performers as that of the orchestra of his time). But our ear takes pleasure in it, since it is already educated to modern life, so prodigal in different noises. Nevertheless, our ear is not satisfied and calls for ever greater acoustical emotions.

Musical sound is too limited in its variety of timbres. The most complicated orchestras can be reduced to four or five classes of

instruments different in timbres of sound: bowed instruments, metal winds, wood winds, and percussion. Thus, modern music flounders within this tiny circle, vainly striving to create new varieties of timbre.

We must break out of this limited circle of sounds and conquer the infinite variety of noise-sounds.

Everyone will recognize that each sound carries with it a tangle of sensations, already well-known and exhausted, which predispose the listener to boredom, in spite of the efforts of all musical innovators. We futurists have all deeply loved and enjoyed the harmonies of the great masters. Beethoven and Wagner have stirred our nerves and hearts for many years. Now we have had enough of them, *and we delight much more in combining in our thoughts the noises of trams, of automobile engines, of carriages and brawling crowds, than in hearing again the "Eroica" or the "Pastorale."*

We cannot see the enormous apparatus of forces that the modern orchestra represents without feeling the most profound disillusionment before its paltry acoustical results. Do you know of a more ridiculous sight than that of twenty men striving to redouble the mewling of a violin? Naturally, that statement will make the musicomaniacs scream—and perhaps revive the sleepy atmosphere of the concert halls. Let us go together, like futurists, into one of these hospitals for anemic sounds. There—the first beat brings to your ear the weariness of something heard before, and makes you anticipate the boredom of the beat that follows. So let us drink in, from beat to beat, these few qualities of obvious tedium, always waiting for that extraordinary sensation that never comes. Meanwhile, there is in progress a repugnant medley of monotonous impressions and of the cretinous religious emotion of the Buddha-like listeners, drunk with repeating for the thousandth time their more or less acquired and snobbish ecstasy. Away! Let us leave, since we cannot for long restrain ourselves from the desire to create finally a new musical reality by generously handing out some resounding slaps and stamping with both feet on violins, pianos, contrabasses, and organs. Let us go!

It cannot be objected that noise is only loud and disagreeable to the ear. It seems to me useless to enumerate all the subtle and delicate noises that produce pleasing sensations.

To be convinced of the surprising variety of noises, one need only think of the rumbling of thunder, the whistling of the wind, the roaring of a waterfall, the gurgling of a brook, the rustling of leaves, the trotting of a horse into the distance, the rattling jolt of a cart on the road, and of the full, solemn, and white breath of a city at night. Think of all the noises made by wild and domestic animals, and of all those that a man can make, without either speaking or singing.

Let us cross a large modern capital with our ears more sensitive than our eyes. We will delight in distinguishing the eddying of water, of air or gas in metal pipes, the muttering of motors that breathe and pulse with an indisputable animality, the throbbing of valves, the bustle of pistons, the shrieks of mechanical saws, the starting of trams on the tracks, the cracking of whips, the flapping of awnings and flags. We will amuse ourselves by orchestrating together in our imagination the din of rolling shop shutters, the varied hubbub of train stations, iron works, thread mills, printing presses, electrical plants, and subways.

Nor should the newest noises of modern war be forgotten. Recently, the poet Marinetti, in a letter from the trenches of Adrianopolis, described to me with marvelous *free words* the orchestra of a great battle:

> "every 5 seconds siege cannons gutting space with a chord ZANG-TUMB-TUUUMB mutiny of 500 echos smashing scattering it to infinity. In the center of this hateful ZANG-TUMB-TUUUMB area 50 square kilometers leaping bursts lacerations fists rapid fire batteries. Violence ferocity regularity this deep bass scanning the strange shrill frantic crowds of the battle Fury breathless ears eyes nostrils open! load! fire! what a joy to hear to smell completely *taratatata* of the machine guns screaming a breathlessness under the stings slaps *traak-traak* whips *pic-pac-pum-tumb* weirdness leaps 200 meters range Far far in back of the orchestra pools muddying huffing goaded oxen wagons *pluff-plaff* horse action *flic flac zing zing shaaack* laughing whinnies the *tiiinkling jiiingling* tramping 3 Bulgarian battalions marching *croooc-craaac* [slowly] Shumi Maritza or Karvavena *ZANG-TUMB-TUUUMB toc-toc-toc-toc* [fast] *crooc-craaac* [slowly] crys of officers slamming about like brass plates *pan* here *paak* there *BUUUM ching chaak* [very fast] *cha-cha-cha-cha-chaak* down there up there all around high up look out your head beautiful! Flashing flashing flashing flashing flashing flashing footlights of the forts down there behind that smoke Shukri Pasha communicates by phone with 27 forts in Turkish in German Allo! Ibrahim! Rudolf! allo! allo! actors parts echos of prompters scenery of smoke forests applause odor of hay mud dung I no longer feel my frozen feet odor of gunsmoke odor of rot Tympani flutes clarinets everywhere low high birds chirping blessed shadows *cheep-cheep-cheep* green breezes flocks *don-dan-don-din-baaah* Orchestra madmen pommel the performers they terribly beaten playing playing Great din not erasing clearing up cutting off slighter noises very small scraps of echos in the theater area 300 square kilometers Rivers Maritza Tungia stretched out Rodolpi Mountains rearing heights loges boxes 2000 shrapnels waving arms exploding very white handkerchiefs full of gold *srrrrr-TUMB-TUMB* 2000 raised grenades tearing out bursts of very black hair *ZANG-srrrrr-TUMB-ZANG-TUMB-TUUUMB* the orchestra of the noises of war swelling under a held note of silence in the high sky round golden balloon that observes the firing. . . "

We want to give pitches to these diverse noises, regulating them harmonically and rhythmically. Giving pitch to noises does not mean depriving them of all irregular movements and vibrations of time and intensity but rather assigning a degree or pitch to the strongest and most prominent of these vibrations. Noise differs from sound, in fact, only to the extent that the vibrations that produce it are confused and irregular. *Every noise has a pitch, some even a chord, which predominates among the whole of its irregular vibrations.* Now, from this predominant characteristic pitch derives the practical possibility of assigning pitches to the noise as a whole. That is, there may be imparted to a given noise not only a single pitch but even a variety of pitches without sacrificing its character, by which I mean the timbre that distinguishes it. Thus, some noises obtained through a rotary motion can offer an entire chromatic scale ascending or descending, if the speed of the motion is increased or decreased.

Every manifestation of life is accompanied by noise. Noise is thus familiar to our ear and has the power of immediately recalling life itself. Sound, estranged from life, always musical, something in itself, an occasional not a necessary element, has become for our ear what for the eye is a too familiar sight. Noise instead, arriving confused and irregular from the irregular confusion of life, is never revealed to us entirely and always holds innumerable surprises. We are certain, then, that by selecting, coordinating, and controlling all the noises, we will enrich mankind with a new and unsuspected pleasure of the senses. Although the characteristic of noise is that of reminding us brutally of life, the *Art of Noises should not limit itself to an* *imitative reproduction*. It will achieve its greatest emotional power in acoustical enjoyment itself, which the inspiration of the artist will know how to draw from the combining of noises.

Here are the 6 *families of noises* of the futurist orchestra that we will soon realize mechanically:

1	2	3	4	5	6
Roars	Whistling	Whispers	Screeching	Noises	Voices of
Thunderings	Hissing	Murmurs	Creaking	obtained	animals and
Explosions	Puffing	Mumbling	Rustling	by	people
Hissing roars		Muttering	Humming	beating	
Bangs		Gurgling	Crackling	on	Shouts
Booms			Rubbing		Screams
				metals	Shrieks
				woods	Wails
				skins	Hoots
				stones	Howls
				pottery	Death rattles
				etc.	Sobs

In this list we have included the most characteristic of the fundamental noises. The others are only associations and combinations of these.

The rhythmic motions of a noise are infinite. There always exists, as with a pitch, a predominant rhythm, but around this there can be heard numerous other, secondary rhythms.

Conclusions

1. Futurist composers should continue to enlarge and enrich the field of sound. This responds to a need of our sensibility. In fact, we notice in the talented composers of today a tendency toward the most complicated dissonances. Moving ever farther from pure sound, they have almost attained the *noise-sound*. This need and this tendency can be satisfied only *with the addition and the substitution of noises for sounds*.

2. Futurist musicians should substitute for the limited variety of timbres that the orchestra possesses today the infinite variety of timbres in noises, reproduced with appropriate mechanisms.

3. The sensibility of musicians, being freed from traditional and facile rhythms, must find in noise the means of expanding and renewing itself, given that every noise offers a union of the most diverse rhythms, in addition to that which predominates.

4. Every noise having in its irregular vibrations *a predominant general pitch*, a sufficiently extended variety of tones, semitones, and quartertones is easily attained in the construction of the instruments that imitate it. This variety of pitches will not deprive a single noise of the characteristics of its timbre but will only increase its tessitura or extension.

5. The practical difficulties involved in the construction of these instruments are not serious. Once the mechanical principle that produces a noise has been found, its pitch can be changed through the application of the same general laws of acoustics. It can be achieved, for example, through the decreasing or increasing of speed, if the instrument has a rotary motion. If the instrument does not have a rotary motion, it can be achieved through differences of size or tension in the sounding parts.

6. It will not be through a succession of noises imitative of life but through a fantastic association of the different timbres and rhythms that the new orchestra will obtain the most complex and novel emotions of sound. Thus, every instrument will have to offer the possibility of changing pitches and will need a more or less extended range.

7. The variety of noises is infinite. If today, having perhaps a thousand different machines, we are able to distinguish a thousand different noises, tomorrow, with the multiplication of new machines, we will be able to distinguish ten, twenty, or *thirty thousand different noises, not simply by imitation but by combining according to our fancy*.

8. Therefore, we invite talented and audacious young musicians to observe all noises attentively, to understand the different rhythms that compose them, their principal pitch, and those which are secondary. Then, comparing the various timbres of noises to the timbres of sounds, they will be convinced that the first are much more numerous than the second. This will give them not only the understanding of but also the passion and the taste for noises. Our multiplied sensibility, having been conquered by futurist eyes, will finally have some futurist ears. Thus, the motors and machines of our industrial cities can one day be given pitches, so that every workshop will become an intoxicating orchestra of noises.

Dear Pratella, I submit to your futurist genius these propositions of mine, inviting your discussion. I am not a musician by profession and therefore, I have no acoustical prejudices, nor works to defend. I am a futurist painter who projects beyond himself, into an art much-beloved and studied, his desire to renew everything. Thus, bolder than a professional musician, not worried about my apparent incompetence, and convinced that audacity has all rights and all possibilities, I was able to divine the great renewal of music through the Art of Noises.

LUIGI RUSSOLO

Milan, March 11, 1913

CHAPTER TWO

Polemics, Battles, and the First Performances of the Noise Instruments

As it was easy to foresee, the futurist manifesto of the Art of Noises, launched on March 11, 1913, raised infinite discussions, disparate comments, and numerous and varied objections. For the *informed*, the Art of Noises was *insanity*; for the *timid, a vain hope*; for the *competent, something unattainable*. For imbeciles, then (admitting that they should be distinguished from the informed, the timid, and the competent) the manifesto was cause for insipid would-be witticisms and endless laughter. Nevertheless, it was printed and commented on by a truly enormous number of journals, especially foreign ones.

After having read the diverse comments that were published concerning the Art of Noises in the *Temps*, the *Matin*, *Figaro*, the *Times*, the *Daily Telegraph*, the *Daily Chronicle*, and in the *Evening Standard*, the *Sun*, the *Berliner Tagblatt*, and the *Neues Wiener Journal* (to cite only a few of the most important) I had to conclude that not one of my critics had understood the real intuitive principle of the manifesto (so clearly presented) nor had they understood the logical and practical realization of this principle.

Some would imagine the only practical result as cacophony, a deafening and disordered muddle of noises without any sense or logic; others, a simple-minded imitation, reminiscent of the noises of life. Others, finally, would see in my manifesto only the frenzy of hurling phrases and snobbish theories to *épater* the good burghers.

None of this discouraged me, of course. And while I was not blind to the great and numerous difficulties to be overcome, I continued and intensified the research for the task that I had set myself, nothing less than a practical realization of the principles expounded in the manifesto.

In my long and patient research in the laboratory, there was always my faithful companion, the genial and tireless collaborator, my fellow painter, Ugo Piatti. Less than three months from the date of the manifesto, on the evening of June 2, 1913, before 2000 spectators at the Teatro Storchi in Modena, I explained and demonstrated the first noise instrument that I had invented and constructed with the help of Ugo Piatti.

This first instrument, a burster (*scoppiatore*), reproduced the noise of an automobile engine and could vary the pitch of the noise within the limits of two octaves. Its performance raised endless discussion, and joking, derisive comments. Enthusiasts were not lacking, however, since everyone was able to hear the change of pitch in a timbre as distinctive as that of an automobile engine.

At the time that I presented this first noise instrument to the public, three other instruments were almost finished: a crackler (*crepitatore*), a hummer (*ronzatore*), and a rubber (*stropicciatore*). Studies and research for still others were already under way. Thus, we went back to work, Piatti and I, to achieve the great ideal of a complete orchestra of noise instruments.

How many long nights we spent up there in our laboratory, alone and intent, in anxious research and feverish acitvity! The joy of each successful accomplishment alternated with the anxiety of ever new experiments, of assumptions that proved false, of difficulties not overcome. But we had the certain, absolute, and unshakeable faith that made us patiently persist, courageously beginning our studies and labors anew each time that it was necessary.

As the long months passed, little by little, the number of noise instruments began to grow; little by little, we filled the gaps that remained in an orchestra suitable for public performance. When the orchestra was almost complete, I began in the free moments between various tasks to compose some pieces of music to perform with the new instruments. I also made studies of the coloristic possibilities of the different timbres and of the means for overcoming the difficulties presented by musical notation, given the new enharmonic possibilities. . . .

We were finally able to realize an orchestra made up entirely of

noise instruments and present a public performance of my three compositions, or "networks of noises," *The Awakening of a City, Dining on the Hotel Terrace,* and *The Meeting of Automobiles and Airplanes.*

The rehearsals were long and tiring. Only at the fourth did the performers begin to get adjusted. I must admit, however, that they suffered with much good will, and that the last rehearsals succeeded in achieving really excellent performances. Only a few intimate friends were present at the dress rehearsal.

Then, the evening before the public performance, when everything was ready, the police suddenly forbade it for reasons of public order! It required the intervention of two Deputies to persuade the chief of police to revoke the prohibition!

The first public performance of the orchestra of noise instruments took place the evening of April 21, 1914, at the Teatro dal Verme in Milan. The public pressed, thronged into the vast theater, but *not* to listen.—The immense crowd was already in an uproar a half hour before the performance began; the first projectiles began to rain upon a still closed curtain.—Thus, the audience heard nothing that evening, simply because they preferred to make their own—non-instrumental—noises!

That they whistled, howled, even that they threw things (certainly no act of heroism) after hearing something that they did not like, that could be understood. . . . But it is difficult to understand why they should go to the theater, paying for seats, so that they *could refuse to listen.* But it was not really the public, that is, not the general public.

At the Dal Verme evening, it was principally the professors of the Royal Conservatory of Milan and some musicians who started the disturbance and who were the most violent in invective and insolence! They were overwhelmed, however, by the formidable and infallible fists of my futurist friends, Marinetti, Boccioni, Armando Mazzi, and Piatti, who plunged into the orchestra while I was conducting the last piece, *The Meeting of Automobiles and Airplanes*, and engaged in a terrible battle that continued even outside the theater. Eleven persons required medical attention, while the futurists, triumphant and completely unscathed, went off to sip their drinks quietly at the Cafe Savini.

It was truly a memorable evening, and one that has been brilliantly described. I think it is interesting to reproduce the account of a correspondent of the Parisian papers:

On the stage, 23 noise instruments, that is, 23 very strange boxes of different and lively colors, bristling with horns, with handles and levers. Behind each one an orchestral performer, pale with the imminence of battle. At the center of the stage, Luigi Russolo, thin, agile, smoking, pointed face, pointed red goatee, dominates everything with his high-held baton, ready to give the first signal.

To the left, we noticed suddenly, standing and ready for the defense, with Marinetti prominent, his futurist friends in a tight group that extended to the footlights. In the hall, an enormous crowd, overflowing boxes, orchestra and galleries. In the most absolute silence, Marinetti requests, in vibrant intonation, the good faith necessary to judge the great artistic discovery of Russolo. His words, resolute and full of quiet menace, are loudly applauded. But after a few bars of the first network-of-noises, *Awakening of a City*, the pastists, who had been content for a while, try to stop the performance at any cost. The uproar becomes deafening. The futurists restrain themselves for an hour. The performance of the networks continues.

At the beginning of the third piece, an extraordinary thing happens: Marinetti, Boccioni, Armando Mazzi, and Piatti vanish from the stage, emerge from the empty orchestra pit, run across it, and hurl themselves among the seats, assaulting the many pastists, now drunk with the rage of tradition and imbecility, with blows, slaps, and cudgels.

The battle in the orchestra lasts about half an hour, while the imperturbable Luigi Russolo continues to direct his orchestra of noise instruments. An impressive simultaneity of bloody faces and noisy enharmonics in an infernal din. The battle of *Ernani* was a matter of insignificance beside this riot.

Up to this time, the futurists had been battling in the streets, in the corridors, all behind the spectators. Now, the performers, having been on the stage for an hour, divided themselves into two groups, one of which continued to serve art on the stage, while the other rushed down into the orchestra to assault and beat the hostile and hissing audience. Thus the escort of a caravan defends itself against the Tuaregs, thus the infantry deploys itself to defend the construction of a military bridge.

The futurists, who are well-trained boxers, left the battle safe and sound, with only a few scratches. The pastists had eleven wounded taken away by the Guardia Medica.

Sequel and epilogue: a sound slap that I gave to a clerical Deputy, the critic of a religious and Austrian-oriented newspaper in Milan, because he took the liberty of writing insults and frivolous defamations of me and my futurist friends. The parliamentarian, who is no prodigy of courage, brought suit. After a little hearing in magistrate's court, in which he made the most of the hilarity of a large audience, I was given a fine with pardon. The moral: fifty *lire* for court costs is a luxury that one can always afford for the satisfaction of breaking the snout of a vile slanderer.

The second performance of the orchestra of noise instruments took place the evening of May 20, 1914, at the Politeama in Genoa. The behavior of the audience was not so absurd and indecorous as in Milan. The people of Genoa had the rare good sense *to want to hear*. A few nuisance-makers were present, but the majority silenced them. Thus, the Genoese public was able to get some idea of what my orchestra sounded like.

Alas, the performance at Genoa was much worse, since a series of bizarre and unforeseeable circumstances deprived me at the last minute of the performers that I had had at Milan, who were already well acquainted with the instruments. I was forced to make do with improvised performers in only four rehearsals, resigning myself to the impossibility of obtaining the best effects of the orchestra.

About a month later the noise instruments were sent to London, where I had concluded a contract with the management of the Coliseum. In London, I found myself immediately in enormous and complex difficulties. Not having been able to engage my Milan performers, I had to be content with the performers of the Coliseum orchestra, assigned to me by the management. Since almost all of these were authentically English, they were almost all very far from possessing the musical qualities necessary to understand what the noise instruments were, and how to get the desired effects from them. The agility, quickness, and ability to adapt readily, indispensible under the circumstances, were almost totally lacking in them. It is enough to say that after ten or eleven rehearsals the performance was much worse than the one at Genoa with only four!

The interest and anticipation of the public were enormous. I was continually besieged by interviewers, avid for particulars and explanations. During the period of the rehearsals, the whole London press was concerned daily with the Art of Noises, so that everything contributed to prepare for the first performance an audience that was enormous, attentive, and well-disposed to listen and try to understand.

There were twelve consecutive performances. The success grew continuously from one to the next, helped by the fact that the performers made notable progress. At the last two performances, some of the results were good, if not all that could be desired—and the public was aware of it, since the applause was so prolonged and hearty that I had to return several times after the curtain fell.

It was a truly inspiring thing to succeed in impressing and drawing applause for the noise instruments at the Coliseum in London, at a theater that has no purpose other than to entertain its own audience, at a theater that has never had any pretense of waging artistic battles and has never presented any show that has not already been approved and applauded in all the theaters of the continent. The noise instruments are not quite so impressive as the beautiful legs of a ballerina! The effort to enter into such advanced sensibility, into so complete and radical an innovation must have left the good Englishmen of the Coliseum in a profound stupor, an unheard-of-amazement!

There was a great advantage in having given our 12 noise-instrument concerts at the Coliseum. In no other theater, either in London or elsewhere, would it have been possible to have such an enormous mass of public—of all kinds, from the highest aristocracy to the simple working man—and also a public that changes every evening. Since the theater was always completely full (its enormous dimensions are well known) an extraordinary number of people must have heard the *strange, bizarre*, and *incomprehensible* thing that is the orchestra of noise instruments.

I had occasion at this time to meet the composer Stravinsky, who was very interested in the noise instruments and later came to Milan to study more closely the effects that were possible and could be used in the conventional orchestra.

From London we should have gone on to Liverpool, to Dublin, Glasgow, Edinburgh and Vienna, and then started another long tour that included Moscow, Berlin and Paris.

The war caused it all to be postponed.

Meanwhile in Italy, the long period of neutrality started. And there began our long struggle for intervention, which lasted until that glorious May when war was declared. Then, abandoning everything to enlist voluntarily, I left for the front, together with my futurist friends, Marinetti, Boccioni, Piatti, Sant'Elia, and Sironi. And I was lucky enough to fight in the midst of the marvelous and grand and tragic symphony of modern war.

CHAPTER THREE

Physical Principles and Practical Possibilities

Acoustical science, which is indubitably the least advanced of the physical sciences, is particularly applied to the study of pure sounds, and until now has completely neglected the study of noises. This is perhaps because it was thought that sounds must be sharply divided from noises—an absurd division, as we shall see later, which has no reason to exist at all.

First, let us see how sounds and noises are usually defined.

Sound is defined as the result of a succession of regular and periodic vibrations. *Noise*, instead, is caused by motions that are irregular, as much in time as in intensity. "A musical sensation," says Helmholz, "appears to the ear as a perfectly stable, uniform and invariable sound." But the quality of continuity that sound has with respect to noise, which seems instead fragmentary and irregular, is not an element sufficient to make a sharp distinction between sound and noise.

We know that the production of a sound requires not only that a body vibrate regularly but also that these vibrations be rapid enough to make the sensation of the first vibration persist in the auditory nerve until the following vibration has arrived, so that the periodic vibrations blend to form a continuous musical sound. At least 16 vibrations a second are needed for this. Now, if I succeed in producing a noise with this speed, I will get a *sound* made up of the totality of so many noises—or better, a noise whose successive repetitions will be sufficiently rapid to give a sensation of continuity like that of sound.

This is the difference between noise and sound according to time, that is, according to the duration of the vibrations. Now let us see the difference according to timbre, that is, according to the *quality* of the vibrations.

First of all we must consider what differences exist in the timbres of noise and sound. We know there are three characteristics of sounds: intensity, pitch, and timbre. As everyone knows, intensity depends upon the amplitude of the vibrations, and pitch upon their number. Timbre lets us distinguish the same note played on different instruments. This shows that timbre is independent of the physical causes that change the intensity and pitch of sound, that is, independent of the amplitude and duration of the vibrations. Timbre depends instead upon their *form*.

We know that a body undergoing simple oscillations yields the design of a simple periodic curve, that is, a sinusoid. A vibrating tuning fork yields this curve. But if we look at the same note produced by a violin, we find that while the length of the wave is exactly the same, the form of its curve is quite irregular. If the vibrations of the tuning fork are simple, therefore, these vibrations are compound, producing a continually altered sinusoid. And if we observe the curves produced by other instruments (still for the same note) we find that the periodic curve is altered once again, but in a manner different from that of the violin. This shows that only the tuning fork produces simple vibrations, although it is well known that the sound is very faint. All other sounds produce an altered periodic curve, which reveals that their vibration is compound.

Thus, every sound is compounded of a number of sounds, which stand in a given interrelationship. With regard to the fundamental tone, this series of sounds (called harmonics) is very strictly defined, since the ratios of their vibrations, taking the fundamental as unity, occur as the series of integers 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, etc. Except for the longest vibration corresponding to the fundamental, therefore, every vibrating body is subdivided into additional aliquot parts that vibrate separately in conjunction with the vibration of the whole, that is, with shorter wave lengths than the fundamental. Thus various *nodes* and *loops* are formed. The diversity and different combinations of these, by determining secondary vibrations (various harmonic sounds according to the particular case), change the timbre of the fundamental note.

In creating noise, then, strength and irregularity with which a body is set into motion will determine the production of extremely

different harmonic sounds. This is the reason for the great variety in the timbres of noises in comparison to the more limited ones of sounds, in which the different timbres are reduced to the few varieties of harmonic components that a vibrating body can produce in the particular conditions necessary for creating sounds.

If I strike or beat violently upon a sheet of metal, I will produce a noise. If instead I hold the sheet by the middle and stroke it with a bow, I will produce a sound. As much in the first case as in the second, I have set the metal sheet into vibration. But in the first case, the violence of the excitation has produced in the sheet an irregular vibration. In the second case, I have placed the sheet in the conditions that are most opportune to produce a regular and periodic vibration.

In the first case, the violent excitation has set the metal sheet into vibration in a greater number of ways, that is, it has produced more nodes and loops, thus being divided into several parts vibrating separately. In the second case, however, the nodes and loops are much less numerous and are related to the various points at which the metal sheet is rubbed back and forth with the bow and stopped with the hand. (Illustrations of Chladni).

What can be deduced from this? When struck violently and divided into more vibrating parts, the metal sheet will produce a larger number of harmonic sounds, which is not the case when it is excited by means of the bow.

The matter is better explained with an example. If I launch a rowboat in still water, I will make a wave which, starting from the rowboat, will expand regularly. But if instead of launching it gently, I also shake it a little, I will still make a wave but no longer just one. Other waves will be formed which will be partly superimposed on the first, different from it but still expanding regularly from the point of agitation. All of which goes to prove that noise is produced when the secondary vibrations are more numerous than those that usually produce a sound.

Thus, the *real* and *fundamental* difference between sound and noise can be reduced to this alone: *Noise is generally much richer in harmonics than sound.* And the harmonics of noise are usually more intense than those that accompany sound.

But, since these harmonic sounds always accompany a predominant fundamental tone, *every noise has a pitch.* And since so many times the possibility of producing the timbre of a given noise (as far as arriving at a single sensation for the ear) was only a question of mechanics, I was able to begin the construction of the noise instruments.

Obviously, it was mechanics that made possible the multiplication of the (very limited) timbres of sound by reproducing and varying the pitch of the (very numerous) timbres of noise. It was a matter of searching out and realizing the varied and manifold means of making bodies vibrate—means that were necessarily different from those used to obtain recognized sounds, since it was a question of producing new, varied and complex combinations of harmonics. The infinite ways in which noise is produced in nature, in life, and above all in machines, offer a large field for the study of these different ways of producing noise vibrations.

But it was not enough to translate these means of producing noise into reality, they had to be translated so as to make possible variation of tones, semitones, and all the enharmonic passages that other musical instruments do not have but are so often found in the noises of nature and life. It is obvious that a formerly restricted field would thereby be opened up. Life offers us an enormous number of noises (and the number is still growing), and therefore the number of noises that can be discovered is infinite.

There is certainly no lack of timbres to imitate and reproduce! And the difficulties that are encountered in realizing the reproduction of these timbres, with the possibility of modifying their pitch at will, are considerable but not insuperable. Thus, as it was possible to construct some twenty noise instruments in a relatively short time with limited means, it will certainly be possible to increase their number indefinitely.

And indeed, the number of noise instruments that have been found possible far exceeds that of those yet constructed.

CHAPTER FOUR

The Noises of Nature and Life (Timbres and Rhythms)

O Pastist Reader, who will have laughed aloud at reading in my manifesto that "we delight much more in combining in our thoughts the noises of trams, of automobile engines, of carriages and brawling crowds, than in hearing again the "Eroica" or the "Pastorale," I want to lead you to the understanding and admiration of the noises that nature and life offer us.

In this brief summation, I will naturally have to limit myself to having you analyze a small number of noises, even though the noises themselves are innumerable. But I will be satisfied if I succeed in convincing you that noise is not always as disagreeable and annoying as you believe and say, and that for him who *understands* it, noise represents instead an inexhaustible source of sensations, from one moment to the next exquisite and profound, grandiose and exaltant.

Let us start with the noises of nature.

Thunder. Mysterious muttering that comes from afar, a threat, or the crash of strange and powerful rhythms that explode to the zenith. Its roars are scattered, hardly weakening, when a new blast resumes and renews them with infinite echos, to which window panes sometimes respond with a high-pitched tinkling. . .

Often a low, human howl, menacing or imploring, sad or even mocking in the high persistent whistlings of the wind, makes an accompaniment to the thunder, with a succession of ascending or descending enharmonic scales, and with pauses that—as in human breathing—hold the necessity of repose.

The wind that sometimes howls in ascending and descending passages within a range that does not exceed a fifth and continues with this variation as a low arpeggio, sometimes instead hurls itself up on high, where it comes to rest on a long and persistent whistling. Pause, silence—complete, sudden.

Suddenly the high whistling resumes, and then, descending rapidly down, down, becomes once again a low howling, receding into the distance.

And what a marvelous variety of rhythm and timbres if the wind is accompanied by rain!

Sometimes the wind directs, dominates, and gives its own rhythm to the roar of water, flinging it violently against walls, windows, and panes. Sometimes instead, it seems that the rain is waiting for the pauses of the wind, then to fall quietly and perpendicularly. At these times, the metallic timbres of roofs and gutters dominate, and the monotonous one of the earth, with a rhythm that is only the rhythm of the rain but still has all the *crescendi* and *diminuendi* of intensity through the greater or lesser amount of water falling.

When the rain falls in large, single drops, the general pitch that results is low. When instead it falls in quantity, the noise of the rain is much higher as a general pitch. This explains why the rain is so well attuned to the wind. Indeed, when the wind whistles high and persistently and causes the water to strike with greater force, this clearly raises its pitch, as if to accord with the wind that dominates and directs it. Then, when the wind has stopped momentarily, it resumes its normal, lower pitch.

Truly, water represents in nature the most frequent, most varied, and richest source of noises. But it is enough to think of the grandiose symphony that the sea produces in all its agitations, of the surf, of the violent and terrible squalls. It would take an entire book to describe and analyze them all. I will only point to the quite famous effect that the waves make in Fingal's Cave, where there is a fundamental pitch with its fifth, tenth, and the minor seventh of the second octave.

It is known that many waterfalls produce a deep noise in which the tones of a perfect triad are clearly audible. In some, the chord F-C-E-G has been found.

And the different tiny noises—do you not remember the gurgle of a spring or brook? You notice, analyzing it, that there near a large rock the water makes a lower noise which is in some way like the fundamental note of a chord, of which the other rocks, smaller and

slightly farther away, often produce the third, fifth, and octave. And the sprinkles of falling water form a kind of musical embroidery, with higher notes and very curious rhythmic strides. If you then study the brook in another way, you notice the tones are different, the rhythms changed.

And in a woods, what a magnificent orchestra the leaves make, whether moved by a light breeze or whipped by a strong wind. Here, you come to the exquisite delicacies of the different timbres of the slightest nuances, enharmonic in their diverse passages of tones, to the most curious and bizarre rhythms! You come to perceive the different ways in which a tree moves, from one to another, which has smaller or larger leaves, thicker or thinner. The poplar makes its eternal *moto perpetuo*. The weeping willow has long and delicate tremblings, like its leaves. The cypress vibrates and sings everything with a chord. The oak and the plane tree have rough and violent motions, followed by sudden silences. . .

But not only different trees produce different timbres, these timbres are different according to the season. Thus, we have tender, very delicate murmurs in the spring, stronger, more intricate and fuller rustlings in summer, and finally the drier, crackling, metallic noises of autumn.

And here it can be demonstrated that the much poeticized silences with which the country restores nerves shaken by city life are made up of an infinity of noises, and that these noises have their own timbres, their own rhythms, and a scale that is very delicately enharmonic in its pitches. It has been neither said nor proven that these noises are not a very important part (or in many cases, the most important part) of the emotions that accompany the beauty of certain panoramas, the smile of certain countrysides!

But let us leave nature and the country (which would be a tomb without noises) and enter a noisy modern city. Here, with machines, life has created the most immense, the most varied sources of noise. But if the noises of the country are few, small, and pleasing, then those of the city . . . Oh! To have to listen to noises from dawn to dusk, eternal noise!

It is quite true that the ear needs relief. Its physical faculties are not unlimited; it needs rest and silence. Very true indeed—but not for the ear alone. Nor does that prove that noises are not musical and cannot become music!

Indeed, who would want an orchestra in his home, however marvelous an orchestra, that would continue for days, weeks, months to play the symphonies of Beethoven? Thus, the objection would be just as valid for the conventional orchestra and for music itself. Let us concern ourselves with the noises of the city, then, and analyze them.

I would like once again to possess the marvelous and fresh and very delicate sensibility of a boy, who is able to reproduce the essence and real character of every sound. There is no child, in fact, who does not know how to produce the essential noise of a locomotive, imitating perfectly the characteristic pulsing of its stacks. And I know a delightful child who knows how to imitate the noise of an electric tram, from its starting to its stopping. I can reproduce this imitation. There is nothing to add; it is perfect.

After the second *ten* (the bell), the child prolongs the *en* and gradually raises its pitch. He interrupts the enharmonic scale for another two *ten ten* and resumes the interrupted scale until reaching a high point, from which he descends rapidly but enharmonically to end with two or three *shee-oo shee-oo* (the valves of the compressed-air brakes!). In this imitation, everything is observed exactly, the restarting of the motor, and simultaneously of the motion of the tram, marked by the gradual rising of pitch in the noise, which completes an ascending enharmonic scale until the maximum speed is regained, from there falling rapidly (much more rapidly than the ascent) with a descending enharmonic scale that corresponds to the rapid decrease in speed.

This typical and characteristic rise of pitch in a noise is found as well in every increase of speed in motors. The decrease is found in every diminution of speed. Thus it is in electric motors, in automobile engines, and in all machines, whether electrical or mechanical, which have increasing or decreasing speeds. And since the speed is always attained gradually, the increase of the pitch of the noise is gradual—and therefore enharmonic.

A general observation that is useful in studying noises in the city is this: in places where continuous noises are produced (much-used streets, factories, etc.) there is always a low, continuous noise,

independent to a certain degree of the various rhythmic noises that are present. This noise is a continuous low sound that forms a *pedal* to all the other noises.

It is not easy to detect the pitch characteristics of this noise. Nevertheless, I have sometimes succeeded in picking it out clearly as a perfect triad, at other times as a fifth alone. This low and continuous noise is always present in a street full of movement and is probably produced by the full, resonating vibrations of the pavement. This noise should not be confused with the particular noises of different vehicles (the scraping and bouncing of the tram on the tracks, of the wheels of carriages and automobiles, the trotting of horses, etc.). It is produced instead by the trembling and vibration made in the pavement by the various vehicles.

This continuous noise changes as a pitch from street to street (and indubitably represents the pitch of any particular street). Above this are then analyzable the various noises that are like harmonic and rhythmic modulations above the continuously held bass.

The street is an infinite mine of noises: the rhythmic strides of the various trots or paces of horses, contrasting with the enharmonic scales of trams and automobiles, and the violent accelerations of their motors, while other motors have already reached a high pitch of velocity—the rhythmic lurchings of a carriage or a wagon with iron-clad wheels, contrasting with the almost liquid gliding of automobile tires . . .

And over all these noises, the continuous, very strange and marvelous hubbub of the crowd, of which only the few voices that arrive clear and distinct can be distinguished from the others, so anonymous and confused.

But the street reveals other interesting noises, too, if instead of standing on the sidewalk among the crowd, we study it from a third or fourth story window. We get our first surprise from the fact that among all the noises, the clearest and most distinct comes from the trembling of the overhead wires of the tram, excited and shaken by the trolley. It is a trembling that has many enharmonic variations of pitch and is transmitted at length to the entire aerial network that supports and feeds the wires, with a fantastic number of resonances!

And when at night the streets are deserted, we can linger to listen to the varied rhythms of the few carriages that pass, the different steps of the horses resonating on the different pavements. Indeed, we can study which of those different rhythms (a horse step, the jolting of the carriages, the jingling of the harness, and so on) are first lost in the distance, becoming a faint bustle, still with the well-defined rhythm of the horse's stride.

And strange, marvelous, and fascinating is the full and solemn breathing of a sleeping city, heard from afar, from the high window of a house in the suburbs, a breathing interrupted only here and there by the whistle of a train, a breathing that may be produced by the sum of the various industries (the electrical plants, train stations, printers, etc.) that work on in the quiet of the night.

It is not possible to give an analysis of the noises of various factories, since they are too numerous and different. I will have to content myself with studying what all machines have in common.

Among the different motors, electric motors are the quietest, and their rhythmic motion is the simplest and the most regular. At first, it might even be believed that they have no rhythm. As everyone knows, the electric motor produces a very beautiful and characteristic hum, which is musically very close to a fifth held by a harmonium. This hum is *continuous*, but if it is studied attentively, it will be perceived every two or three seconds to have a slight variation of pitch, a slight variation of intensity, after which it returns to the previous pitch or intensity. These slight variations, which are like thematic repetitions, indicate in a certain way the beat of that long-held note and thus determine a rhythm that varies from motor to motor, being constant (that is, synchronous) for any given motor.

A noise that somewhat recalls the timbre of electric motors, but is much more varied and intense, is that of the mechanical saw-mills for lumber. Here, the toothed steel blade of the saw emits a noise whose pitch is quite easily determined. The pitch varies according to the thickness and length of the blade itself, producing enharmonic passages in pitch that depend on whether the wood that it cuts is thick or thin, wet or dry.

In machines with complex movements, it is the rhythm that is especially interesting. Indeed, in a single machine there are complete rhythmic cycles. We have ordinary movement, or movement in four (2/4, 3/4, 6/8, and so on) before arriving at the most complex rhythms (5/4, 7/4, and so on) sounded and defined by the movements and noises of the different levers and arms that compose the machine. In certain marvelous printing machines, it is most interesting to compare the noise of a very rapid repeated movement with others of different timbre and less rapid rhythm, and then with still others, heavy, slow and solemn.

No musician could ever have the rhythmic richness of machines.

And are we not surrounded by strange and curious noises in our own home, by the most indefinable timbres and the queerest variations of pitch, emanating from the various pipes for drinking water, gas and heat? Who can deny that these noises are less annoying than those made from morning to evening by the neighbor's piano?

And I have said nothing of the complex noises of a train in motion, which through their changes of rhythm and timbre reveal to an attentive ear not only the speed of the train (perceived by the ear through the more or less hurried beats of the wheels at each joint of track) but also whether the train is moving over a metal or a stone bridge, on an overpass, or on a rising or a falling grade.

And finally, if we finish by analyzing the slightest and apparently least interesting noises, we can make observations that are useful in understanding the other, larger and more significant noises.

Thus, a variety of timbre can be found within a single timbre. In some noises with rhythmic beats, like the tick-tock of a clock or the trot of a horse on an evenly paved street, we can often hear a difference from beat to beat. But we often discover that the degree of this difference is minimal, so that the interval of a semitone at the piano will appear enormous by contrast. It is a matter of a tiny fraction of a tone.

So far, especially with clocks, no *difference of pitch* has been detected between the first and second strokes. Certainly we can hear that the two beats are not identical. It is not a matter of difference of rhythm (the experiment was made with a clock having a very regular beat). No difference of pitch can be heard; but the sensation persists that the beats are not equal. If we listen attentively, we perceive that the difference lies in the *timbre*. Since diversity of timbre is only diversity of the harmonics of the sound, it is clear that while the two beats have the same fundamental tone, they vary in the composition of their respective harmonic sounds.

This phenomenon is not as insignificant as it first appears, since it is found again in a number of other noises. I have encountered it in the pulsations of the smokestacks of different steam engines, in the whistlings emitted by the steam leaving the stacks, as well as in the firing of the different cylinders of an automobile or airplane motor, in which each cylinder is often characterized by its own timbre. All of which shows what a variety of delicate shading of timbre can be obtained even with a single pitch and the same noise.

Thus, the constant and attentive study of noises can reveal new pleasures and profound emotions.

I remember that the performers that I employed for the first concert of noise instruments in Milan had to confess this truth, with deep wonder. After the fourth or fifth rehearsal, *having developed the ear* and having grown accustomed to the pitched and variable noises produced by the noise instruments, they told me that they took great pleasure in following the noises of trams, automobiles, and so on, in the traffic outside. And they verified with amazement the variety of pitch they encountered in these noises. It was the noise instruments that deserved the credit for revealing these phenomena to them.

But I hope that my reader, too, if he would like to analyze the noises of nature and life in the manner that I have presented in this chapter, will be able to find equal pleasure and an unsuspected number of new emotions there.

CHAPTER FIVE

The Noises of War

Joining my futurist friends in the various battles on the side of the Almighty, battles that were crowned by the taking of Casina and Remit ridges, I had ample opportunity to study the noises of war, both those that threatened us close at hand and those in the distance, which filled the Val di Ledro, Val d'Adige, and Valle del Cameras day and night.

One night at Casina Ridge, one of our Alpines, strong, calm, and well acquainted with the mountain, was on guard in a little advance post with an infantryman who was under fire for the first time. The infantryman, aware of his responsibility and a little nervous, kept thinking that he saw the shadows of enemy patrols advancing through the woods among the wet leaves that glittered in the bright moonlight. He prodded the Alpine with his elbow, whispering, "Someone is moving out there!" The Alpine looked and naturally saw nothing. Finally, tired of the repeated alarms, he put his ear to the cliff and listened for a long time. "There is nobody there!" he said. Such calm and certainty issued from his words that the infantryman was completely reassured. The ear had judged with greater certainty than the eye!

In modern warfare, mechanical and metallic, the element of sight is almost zero. The sense, the significance, and the expressivenss of noises, however, are infinite. And since traditional poetry lacks suitable means for rendering the reality and the value of noises, modern war cannot be expressed lyrically without the noise instrumentation of futurist *free words*. While the most illustrious poets continue to silence modern warfare in their medieval or Greco-Roman compositions, the futurist poets were and are since the beginning of the Libyan War the only ones who depict in noise with *free words* the essence of today's battles.

From noise, the different calibers of grenades and shrapnels can be known even before they explode. Noise enables us to discern a marching patrol in deepest darkness, even to judging the number of men that compose it. From the intensity of rifle fire, the number of defenders of a given position can be determined. There is no movement or activity that is not revealed by noise.

But noise, which conquers the blackest gloom and the densest fog, can betray as well as save. How many times have our wonderful soldiers had to take off their noisy hob-nail boots or wrap them with trench sacks so that the noise would not reveal their approach to an enemy trench!

Marvelous and tragic symphony of the noises of war! The strangest and the most powerful noises are gathered together there! A man who comes from a noisy modern city, who knows all the noises of the street, of the railway stations, and of the vastly different factories will still find something up there at the front to amaze him. He will still find noises in which he can feel a new and unexpected emotion.

Artillery, when still out of range, is announced only by a distant murmur, exactly like thunder. But as it draws closer, little by little, the murmur becomes distinct in explosions that maintain the fullness of thunder, and the reports of our own artillery can be distinguished from those of the enemy. But it is only when it comes within range that the artillery reveals completely the epic and impressionistic symphony of its noises. Then, the pounding of the firing acquires a timbre of metallic crashing that is prolonged in the howl of the shell as it rips through the air, losing itself in the distance as it falls. Those coming in, however, are announced by a distant, breathless thump, by a progressively louder howling that takes on a tragic sense of impending manace, ever greater and closer, until the explosion of the shell itself.

The whistling of the shell in the air varies with the different calibers. The smaller the caliber, the higher and more regular the whistling. With larger calibers, this whistling becomes lower and more irregular in pitch, and to the characteristic noise of violently torn canvas, there are added other, smaller ones, with surges of intensity. With the very largest calibers, there is a noise very little different from that of a train passing nearby. Whatever the caliber of the shell, the whistling that it makes in the air is the same in one

respect: from the moment the shell leaves the cannon until its arrival, it falls in pitch until the explosion. This difference in pitch can equal or even exceed two octaves in a long trajectory. The passage from the highest pitch to the lowest through all the steps of the scale is made *enharmonically*, that is, it is a true *shading* from the highest to the lowest pitch.

These enharmonic passages from one pitch to another, which are also found in the whistling of the wind and in the howling of sirens, are completely unknown to present-day orchestras, which can produce only diatonic-chromatic passages—although such enharmonic passages can be quite easily effected with a noise instrument. The characteristics of the shell's whistling in the air are easily explained by the fact that the velocity of the shell, greatest at the beginning, gradually diminishes. Hence, the vibrations of the air—produced by successive impulses of condensation of the air in front of the projectile and consequent rarefaction behind it—follow each other with decreasing frequency. Thus, communicating ever slower vibrations to the air, a gradual lowering of pitch results. The whistling, when the shell is a grenade and hurls itself against any hard body, ends in an indescribable violence of explosion.

The acoustical effects of shrapnels at the moment of explosion are very strange and curious by contrast. As known, shrapnels do not explode on contact but are timed by a fuse that is automatically ignited at the moment of firing and continues to burn during the flight of the shell, thus setting off the explosive while the shrapnel is still some meters from the target. In these shells the whistling is violently interrupted by a furious *meow*, simultaneous with the explosion itself. No matter how short, this *meow* produces a rapid enharmonic passage, descending more than an octave.

I remember that soldiers remarked of the first shrapnels that there must have been a cat inside! Probably, the effect is produced by the fuse when it is violently hurled out by the explosion, making a rapid flight through the air that follows the same laws that determine the path of the shell, with the relative acoustical effect.

At first, it seems impossible to explain why the distant explosion of the cannon blast at long range should be heard first, then the whistling of the shell in the air, and finally, the explosion of the grenade or shrapnel—knowing that the speed of sound in air is considerably less than the initial speed of the shell. In other words, the shell should always arrive before the noise of the cannon blast that launched it. But at long ranges, while the speed of sound is constant (about 340 meters a second), that of the shell, greater at the beginning, diminishes at a uniform rate. Also, the sound is propagated all around in a direction perpendicular to the point of departure, while the path of the shell describes a parabola, that is, it has a much longer path to travel. Thus, at long range, the noise of the blast arrives before the shell itself.

At short range, however, by maintaining a velocity greater than that of sound and traversing a much less curved path, the shell travels very low, grazing the ground, and no longer makes its characteristic and musical whistling but rather a violent and vibrant *vrrrr* that instantly ceases with the explosion.

Grenade explosions, considered by themselves (that is, independent of the other noises that they produce: crashes of rocks, fragments of shells rebounding all around), have a pitch that is lower in proportion to the size of the grenade and the explosion. There is even a kind of scale in the pitch of the explosions, which rises from the lowest notes (represented by the explosion of the largest grenades) to the highest notes (represented by the *tek-teek* of certain matches or the paper-caps that children use for their harmless pistols), ranging through all the intermediate explosions represented by increasingly smaller grenades and bombs.

In order to explain these different pitches, we must consider the mass of air displaced by the gas released from the shell as a vibrating body. The greater this mass the longer and slower the vibration, so that the pitch of the explosion is lower.

The machine gun has a characteristic wooden voice, with its rapid *tok-tok-tok-tok*, followed by a *shaaab*, like waves against the rocks, produced by its bullets in the air.

The Austrian rifle—heard from our trenches (I do not know how it sounds to those who are shooting)—has a curious noise of two beats: *tek-poom*. Ours has s single, dry report that becomes muffled at a certain distance. The rifle bullets make a *tseeoo* in the air (like birds that sing *tsee* instead of *chee*) and themselves have a short, rapid, descending scale, beginning high with the timbre of *ee*, then dying away with *oo*.

And if a grenade exploding in a high position hurls its fragments onto a slope, they drift at length in oblique, descending trajectories, with a long *voooo*, like large, insidious and invisible flies.

There are the explosions of the grenades, with their blasts and lacerations, the crackling of rock fragments in a hundred-fold multiplication of projectiles that pour down from everywhere, the

stormy smashing of bullets against the rock, with their furious rebound, as if they had not even struck, the continuous *tek-tak-trak* of rifle bolts, opening and closing, opening and closing in incessant motion, the blasts of rifles, recoiling against the shoulder . . . and over all this, the *tseeoo* of bullets that, like the sinister whining of grenades and shrapnels, always seem to be coming straight at you yourself! You expect them to come right there! Every soldier has the same feeling!

Meanwhile, up there high over your head, the long shots of the artillery pass, seeming to act on their own, far from the hell down here.

But when, rifle ready but momentarily still in expectant vigil, only the big guns speak in their long duels, the soul of the soldier is suspended, intent on the familiar noise of our own volley, or of the huge Italian shells!

With what hopes for success you have struggled on! How you have looked forward to smashing an Austrian trench, to hitting a gunpit or an emplacement, and especially to silencing the enemy artillery, the battery that always returns your fire, the accursed battery that flings up its grenades and its furious shrapnels!

It picks out and recognizes your noises. It knows that a noise that you make down there indicates a certain act of destruction. It knows that another of your noises will sweep the road clean in a flash for those who will complete the work of victory with a bayonet.

CHAPTER SIX

The Noises of Language (Consonants)

In recent times, thanks especially to Italian scientists, there has been a great development in investigations of the influence of music on language, on the intonation of the speaking voice, on the sounds that compose vowels, and on the variation of sounds according to pitch and mood. The experiments of Prof. Aristide Fiorentino have been very interesting in this regard.

At the First International Congress of Experimental Phonetics, it was proven that not only music but indeed noise exercises an influence on the voice. Professor Baglioni of the University of Sassari was able to prove that when speaking, one pitches one's voice to the dominant sounds or noises of one's surroundings. From this fact stems the influence of natural noises like waterfalls, ocean waves, wind, and so on, on the timbre and intonation of the voices of those exposed to these influences.

Persons who live in the fields, in the mountains, or by the sea have much louder voices than city dwellers, because in speaking they often have to overcome the noise of the wind or the waves. For similar reasons, the same thing happens with workers in certain industries, forced to remain all day in the midst of the noise of machines in motion.

Experimental phonetics has ascertained that many of the particularities of the language of entire social classes, or of entire populations, are determined by the force that this powerful and continuous creation of phonemes exerts on the mechanisms of articulation in writing and speaking.

But beyond these instances of—let us say—the very occasional influence of nature, the acoustical conditions of the environment have much more subtle influences on the quality of the voice. When speaking, a person pitches his voice to the dominant sounds or noises of his surroundings even if he does not need to overcome them to be heard. It is an involuntary and unconscious tendency that has the character of of a general psychological phenomenon of nature.*

Thus, the influence that noise exercises on the voice, and hence on language, is incontestable.

But it is of noise as *an element of language itself* that I want to speak, an element that has not previously been considered in terms of the importance that it deserves.

Vowels represent sound in language, while consonants clearly represent noise.

Hence, noise—which encountered so much hostility when we attempted to bring it into the realm of music—is a very important part of language, and also of song.

Language has a richness of timbre unknown to the orchestra, which should prove that nature itself had recourse to the timbres of noise, when it wished to increase and enrich the timbres of the magnificent instrument that is the human voice. It is important in this regard that no noise exists in nature or life (however strange or bizarre in timbre) that cannot be adequately, or even exactly, imitated through the consonants. The only difficulty in this imitation is the shortness of the consonant itself, which would have to be repeated many times quite rapidly (16 times a second) to be able to produce a given timbre for any length of time.

Some consonants, however, can be held long enough and require nothing more to be perfect and well-pitched noises. It is understood that the consonants are not prolonged with a vowel, of course, since the prolongation would be made with the vowel and no longer with the consonant. The consonance itself is pronounced rather than its name. The following consonances are easily pronounceable: R, S, F, Z, V, and C. The consonances B, D, M, N, P, Q, and T are much less so, and so on. Those that lend themselves better to being pronounced

*See the report of the First International Congress of Experimental Phonetics in the *Corriere della Sera*, May 6, 1914.

are more easily defined in pitch and can be used for enharmonic passages.

Try to imitate any noise whatever, and you will see that with a consonance or with a combination of several consonances you can produce any noise you want—with less intensity, but with a perfect likeness of timbre. The enormous importance of this fact does not need to be explained at length.

But only the futurist poets, with their *free words*, were able to hear the entire value of noise in poetry. By making use of noise onomatopoeias, they revealed all the enormous importance of this element of language, which had previously remained the slave of vowels. For centuries, poets did not know how to make use of this very effective source of expression in language. In the futurist *free words*, the consonant representing noise is finally adopted for its own sake; and like music, it serves to multiply the elements of expression and emotion.

Here, I leave the words to Marinetti, the creator of *free words*:

> When I said that "every day you must spit on the Altar of Art," I was urging the futurists to free lyricism from the solemn air of contrition and adulation that used to be called *Art with a capital A*. Art with a capital A constitutes the clericism of the creative spirit. Thus, I incited the futurists to destroy and to ridicule the garlands, the palms, the halos, the precious frames, the stoles and cloaks, all the historical costumes, and the romantic *bric-a-brac* that forms a great part of all the poetry before us. I championed instead a lyricism that was rapid, brutal, and immediate, a lyricism that must have appeared antipoetic to all of our predecessors, a telegraphic lyricism that had none of the taste of books, and as much as possible the taste of life. From this emerged the courageous introduction of onomatopoetic chords to render all the sounds and noises of modern life, even the most cacophonous.
>
> The onomatopoeia, which serves to enliven lyricism with the crude and brutal elements of reality, has been used in poetry (from Aristophanes to Pascoli) more or less timidly. We futurists begin the constant and audacious use of the onomatopoeia. This use does not have to be systematic. (For example, my *Adrianopolis-Siege-Battle* and my *BATTLE Weight + Odor* demanded many onomatopoetic chords.)
>
> Our growing love for material things, the will to penetrate them and recognize their vibrations, the physical sympathy that is attached to motors, all leap to the use of the onmatopoeia.
>
> Noise being the result of friction or collision of solids, liquids, or

gas in motion, the onomatopoeia, which reproduces noise, is one of the most dynamic elements of poetry. As such, the onomatopoeia can employ the verb in the infinitive, especially if it is opposed to one or more other onomatopoeias.

(Example: the onomatopoeia *tatatata* of the machine guns, opposed to the *urrrraaaab* of the Turks in the final chapter, "Ponte," of my *ZANG TUMB TUUMB*.)

In this case, the brevity of the onomatopoeias permits very agile interminglings of diverse rhythms. These would lose part of their impetus if expressed more abstractly, with greater development, that is, without the device of the onomatopoeia. There are different types of onomatopoeias:

a) the direst, imitative, elementary, realistic onomatopoeia, which serves to enrich lyricism with brutal reality and prevents it from becoming too abstract or too *artistic* (Example: *pic pac poom*, rifle fire). In my "Contrabando di Guerra" in *ZANG TUMB TUUMB*, the strident onomatopoeia *sseeee* gives the whistling of a tugboat on the Meuse and is followed by the muffled onomatopoeia *ffeeeee, ffeeeee*, the echo of the high river bank. The two onomatopoeias freed me from having to describe the breadth of the river which is defined by the two consonants *s* and *f*.

b)the indirect, complex, and analogic onomatopoeia. (Example: in my poem *DUNE*, the onomatopoeia *dum-dum-dum-dum* expresses the rotative noise of the African sun and the orange weight of the sky, creating a bond between the sensations of weight, heat, odor and noise. Another example: the onomatopoeia *strioionla stridionla stridionlaire*, which is repeated in the first canto of my epic poem *LA CONQUETTE DES ETOILES*, forms an analogy between the clashing of the great swords and the furious agitation of the waves before a great battle at sea in a storm.)

c) The abstract onomatopoeia, the noisy and unconscious expression of the most complex and mysterious motions of our sensibility. (Example: in my poem *DUNE*, the abstract onomatopoeia *ran rån ran* corresponds to no noise of nature or machine but expresses a state of mind.)

d) The psychic onomatopoetic chord, that is, the fusion of 2 or 3 abstract onomatopoeias.

I will give some examples of onomatopoetic chords, taken from my poem *ZANG TUMB TUUMB*, in which noises resulting from the use of consonants predominates:

Example 1:
[THE VISCERAL REPERCUSSION OF THE LYRIC ONOMATOPOEIAS OF A TRAIN]

tlabtlabk ee ee gueeee
trrrrrrtrrrrr
tabtabtabtob-ob tabtabtabtob-ob
(WHEELS)
cubrrrrr
cubrrrrr
cubrrrrr
cubrrrrr
[LOCOMOTIVE]
foofoofoofoofoofoo
fabfabfabfabfabfab
dsabdsabdsabdsabdsab
tsabtsabtsabtsab

Example 2:
BLEU) double snnorrrring of a reservist + biplane
(high) HHRAAAAaaaa
hrrrrrr(low)

Example 3:

80 Km. an hour **TRrrrrrrrrrrrrr**	very fast sedentariness of the half-reclining chauffeur in the steering Saturno in the ring turning making of the foot at the very disssstant little blue foot of the maddest speeds *glou glou glou* of the air in ear-bottles wind wind-triloquist.
95 Km. an hour **TRRRRRRR**	musical abandon of the half-reclining chauffeur under the steering holding the pedal at the snoring organ of breathing kilometers in a distant back-blown puff
100 Km. an hour **TRRRRRRR**	pressing with right foot accelerator distances + 1000 profundities + 300000 resistances of the earth to the sssliding speeds offer themselves *pan-pan-traaak tatatraaak*

Example 4:

rrrrrr pfapfa pfapfapfapfapfapfa waving of 45 smokestacks-blackness-arms each with a white armrest signed with a black **N V M B C** streetlamps red green intestines of embers *chun-chak-chak-chak-chak-chak gott-gott glugluglu* between ports odor of tar oil-hot dung grain saltiness holds *yeeeess-yes I go-o I go-o-o you go-o-o I go-o-o-o flak pataflak*

Developing the investigations of the psychic nomatopeotic chord, abstract verbalizations of forces in motion are added.

Example:**

Verbalisation dynamique de la ruote	mocastrinar fralingaren donì doni doni **X X + X** vronkap vronkap **X X X X X** angolò angoli angolà angolin vronkap + diraor diranku falasò falasòhh falasò picpac via **AAAR** viamelokranu bimbim nu ranu = = = = + = raruma viar viar viar

These examples are sufficient to demonstrate the great efficacy and intensity of expression attained through the use of consonants.

A new and interesting investigation could be that of studying the origins of language and words with reference to the imitation of noises, to which the first men probably resorted in order to understand each other. By attributing to each animal the consonants that most nearly represented its cry, and to things the consonants that represented the noises they produced in daily use, they may have created the first language.

But let us leave these investigations to the studious and to those who exhume the prehistoric. We are concerned only with noise in art.

**Translator's note: because of its complete lack of denotative meaning, this last example has been left in the original.

CHAPTER SEVEN

The Conquest of Enharmonicism

After the introduction of the tempered system in music, only the word *Enharmonicism* remained to indicate the values that no longer found correspondences in musical reality. Indeed, the difference between an E sharp and an F, and a B sharp and a C are called enharmonic, while the tempered system, in rendering the semitones equal, has removed this difference and made the two notes into the same sound.

But unfortunately, the inconvenient result of the tempered system does not lie only in the word. Once that the octave was divided into only twelve *equal* fractions and applied in the tempered scale, there resulted a considerable limitation of the number of practical sounds and a strange artificiality in those that were adopted. The difference between the scale of the tempered system and the natural one are well known.

And it is surely known that in instruments with free intonation (the string instruments) custom and necessity lead the performer to subdue the tendency to play in the intonation of the natural scale in order to be in accord with tempered intonation. With wind instruments, which produce the harmonic series of the fundamental note, the 7th, 11th, 13th, and 14th harmonics are likewise corrected in their intonation to produce what we call closed sounds.

In the tempered system, therefore, the difference between the large and small whole tone (9/8:10/9= 81/80) has disappeared. Similarly, the differences between the diatonic semitone (16/15) and the chromatic ones (23/22 and 25/24) have also vanished.

While in the different scales of the natural system, a single note could have up to four different intonations (that is, could be represented by four different ratios of vibration) in the tempered system it is always identical with itself. Thus, natural intonation is altered to arrive at sounds that are false and arbitrary for the ear—and worse, there is an enormous limitation in the number of sounds that can be used and a complete lack of shading between one and another.

A tempered harmonic system can be compared in a sense to a system of painting that abolishes all the inifite gradations of the seven colors (red, orange, yellow, green, blue, indigo, and violet) and accepts only their type of color, having only one yellow, one green, one red, and so on. A kind of painting that was ignorant of the different *tonalities* of the same color would have no rose, no scarlet lake, no bright yellow, no dark yellow. This kind of painting would be comparable to the sounds of the tempered diatonic scale. With the addition of five gradations, it might produce what is our chromatic scale. It is obvious how limited in means and deprived of coloristic sensations such painting would be. The present tempered system is in the very same state as this kind of painting.

Temperament, with its identical pitches, has in a sense torn the notes apart from each other, taking away the most delicate bond that can join them, the fractions of a tone smaller than the present semitone.

It is believed that the Greeks knew and practiced enharmonicism. Still, there is a great uncertainty in speaking of musical systems that are deduced from complicated and uncertain theories, not knowing if, or to what degree, these theories were applied in practice. However, it is certain that after the introduction of the tempered scale, even if limited to just the difference of a comma, enharmonicism no longer exists as a *musical reality*. I say *musical reality* because, as we will see presently, in nature and in life sounds and noises are *all enharmonic*.

Studies and investigations for the construction of the noise instruments led me to some conclusions in the matter of enharmonicism, practical as far as the material possibility of adopting it, artistic as far as the necessity of finally getting out from behind the stupid walls of the artificial and monotonous semitone. These conclusions find their confirmation in the consideration, which I will call physical, of the existence of enharmonicism in nature. It is really time that the domain of sound was enriched with all the

infinite possibilities of shading between one sound and another, thus arriving at musical sensations previously unknown.***

There is first of all this fact: all the sounds and noises that are produced in nature, if they are susceptible to variation of pitch (that is, if they are sounds and noises of a certain duration) change pitch *by enharmonic gradations and never by leaps in pitch*. For example, the howling of the wind produces complete scales in rising and falling. These scales are neither diatonic nor chromatic, they are *enharmonic*.

Likewise, if we move from natural noises into the infinitely richer world of machine noises, we find here also that all noises produced by rotary motion are constantly enharmonic in the rising and falling of their pitch. This rising or falling of pitch is naturally in direct proportion to the increasing or decreasing speed. Example: dynamos and electric motors.

No matter how gradual, the rising or falling of the noise sound is still perceived even by persons endowed with a mediocre musical ear. That differences smaller than the semitone are audible for the human ear can be easily proved with the sonometer, or even in tuning or fingering the violin. Indeed, these experiences prove that not only differences of 1/4 but also of 1/8 tone are audible to the ear.

Thus, the question is logical: if these enharmonic sounds exist in nature, or as we have seen, if in nature noise-sounds are found only in conjunction with enharmonic sounds and are easily perceived by the ear, why not use them in musical art? Certainly, it is strange that the need to rejuvenate and enlarge the musical system was not felt before, since this musical system is basically the same one that was handed down from the Middle Ages. All the magnificent harmonic system that has been built upon such a limited basis has now been found to be completely exhausted and fruitless, bound within the spiraling poverty of its starting material: sound. As I have already noted in my futurist manifesto, *The Art of Noises*, the sound presently used in musical art is very limited as QUALITY, or timbre. If that were not enough, even its development, and therefore its quantity, has been restricted through the use of the diatonic system.

***Translator's note: at this point the text contains a number of typesetting errors that make the reading of this paragraph uncertain.

Futurism is enlarging this field also, as it has enlarged painting with Dynamism, and poetry with Unbound Imagination and Free Words.

And so:

With the introduction of plentifulness and variety of noises in music, it has ended the limitations on sound as quality, or timbre.

Noise, in fact, is nothing but sound very rich in harmonics, stronger and more audible than they are in sounds properly so called and commonly used.

With the introduction of noises in fractions of a tone smaller than the semitone, that is, with the introduction of the enharmonic system, even the limitation of sound in its quantity has been removed.

Indeed, in the construction of the noise instruments, we were searching not only for the possibility of changing the noise-sound by tone and semitone but also for that of any gradation whatever between one tone and another. And we succeeded perfectly in obtaining fractions of a tone, no matter how small. *Thanks to the noise instruments, then, enharmonicism is today a reality.*

Can enharmonicism produce these sensations for ears so long accustomed to the diatonic and chromatic system? Some observers will be immediately convinced that, although accustomed to the diatonic-chromatic system, the ear actually prefers the natural scale and enharmonic passages. It has been proven by numerous experiments that a person singing *freely* follows the natural scale, with its differences of a comma, and that *portamento* passages with the voice achieve an enharmonic gradation.

Thus, for example, a singer moving from the scale of the key of C to that of the key of D does not pitch the same notes as before but in relation to the natural scale based on the new tonic D. Thus, he alters by a comma the large or small whole steps and the diesis, which will be 23/22 or 25/24 according to the large or small tone altered.

My friend Pratella, in his *Technical Manifesto of Futurist Music*, has already said:

> Above all, *enharmonicism* makes possible for us the natural and instinctive modulation and intonation of the enharmonic intervals, presently unattainable given our scale in the tempered system, which we want to overthrow. We futurists have long loved these enharmonic intervals, which we find not only in the dischords of

> the orchestra, when the instruments are playing in different systems, but in the spontaneous songs of the people, when they are pitched without the preoccupation of art.

Thus, the ear is sensitive even to these very small differences, since it uses them.

Consequently, greater pleasure is felt in hearing an instrument capable of free intonation. For example, everyone admits that the violin is more fascinating, more lyrical, and less tiring than the piano. This fact, which everyone perceives and few take into account, is due to the enharmonic possibilities of the violin, which the piano (the most tempered of all instruments) is entirely lacking. The violin can produce scales in natural intonation and can produce any enharmonic gradation of the notes with a *portamento*.

The unfortunate thing is that it is usually played *badly*, since as I have already noted, everyone forces himself to suppress his instinctive tendency and play according to the tempered scale. And if some rare concert artist, especially when playing without accompaniment, uses natural intonation, he is unfailingly accused (by the very wise *connoisseurs* and *arbiters* of taste) of incorrect intonation! But variation of intonation can always be heard in violin playing, and it is just for this reason that the violin has a fluidity, a variety of expression that the piano does not. The latter, instead, confers on the music a dryness, an aridity all its own, owing precisely to the complete lack of enharmonic possibilities.

All this proves that enharmonicism is much more logical, much more natural, and much more pleasing to the ear than any other system. Any doubt raised by the adoption of enharmonicism in practice, therefore, is laid to rest.

It is not only with reference to the natural diatonic scale and to the adoption of these enharmonic differences of a comma that the noise instruments realize enharmonicism. They make possible instead a complete enharmonic system, in which every tone has all possible changes, subdividing itself into an infinite number of fractions. This leads, naturally to modifications in the present system of musical notation, and of this I shall speak in the next chapter. It seems pointless to add that since in the enharmonic system the noise-sound can assume any pitch it chooses, it can also produce the chromatic and diatonic scales. Including in itself the present diatonic system and its possibilities, the enharmonic system adds to them all its own possibilities, which are infinite. It is impossible to imagine a more complete musical system at the present stage of our acoustical knowledge.

Now it can be realized, with different noises, with the different timbres of a single noise, with the infinite possibilities of enharmonic passages, what richness and vastness of sensations are contained in the *Art of Noises*. We have finally conquered all possibilities. Here are every form of scale, natural, diatonic, Pythagorean, tempered, chromatic, and enharmonic, the most infinite variety of timbres, all forms of chords and associations of triads, dissonances, and enharmonicisms.

There is no limit, then, and no restrictions. Melody and harmony are no longer channeled between two insurmountable banks (poverty of timbre and poverty of pitch) but finally free, with the possibility of all expansions and all forms. We finally have *noise-sound* material capable of assuming without exception all the forms that the futurist artist may wish and know how to give them.

CHAPTER EIGHT

Enharmonic Notation

The total conquest of the enharmonic system attained with the futurist noise instruments has made necessary some modifications in the present method in musical notation. This method as it exists today considers only the subdivisions represented by the semitone, while the noise instruments are able to realize any fraction of a tone. Thus, it became necessary to find an easy and simple way of indicating these subdivisions, that is, a way of notating *enharmonic music*.

Different systems of present-day notation were considered at various times but were quickly discarded because they were impractical or useless. One system of musical notation that is certainly logical and rational is that with numbers, labelling the first degree of the scale with the number 1, and the following degrees with 2, 3, 4, 5, 6, and 7. Although logical in appearance, this system was enormously complicated and particularly slow and difficult to read. The eye, confronted with a page filled with numbers, had to read these numbers one by one and identify them with the degrees of the scale, a process that the uniform disposition of the numbers on the page did not help or speed up. Thus, while a rapid glance at a page of music written on the usual staff is sufficient to give a complete idea of the degree of harmonic and rhythmic complication of the music, a page of music written with a system of numbers tells us nothing until we have read it all, identifying each number. This is because the usual system of notation, with its notes and stems placed at various heights on the staff, forms a variable and characteristic *arabesque*. This arabesque in its total form is a very great help to us in immediately identifying the music we are reading and in transforming it at once into music that we *hear*.

The decisive importance of rapid and immediate reading in a system of musical notation is obvious. I kept this need for rapid and easy reading in mind in my search for a notational system for enharmonic music; and I discarded the number system at once.

I was able to resolve the difficult problem of enharmonic notation by retaining the present staff and varying only the form and method of indicating notes on it. It was unnecessary to change the number of lines, as others have proposed, since the result, although often logical (e.g., the whole tone indicated on the line, the semitone in the space) had the inconvenience of enlarging the space occupied by a single octave, with the consequent necessity of numerous transpositions to the octave above and below.

In all this excursion through the various systems of musical notation, I did not find one that had been proposed for the precise purpose of notating enharmonic music. And that was logical. Why create a system of enharmonic notation if there were no instruments to perform enharmonic music? It was the realization of enharmonicism with the futurist noise instruments that made the corresponding system of notation indispensible.

It should be borne in mind that Enharmonicism, as a total system and as produced by the noise instruments, has the characteristic possibility not only of dividing the interval of the whole tone into a given number of smaller intervals but also of producing the *change* from one tone to another, the shading, so to speak, that a tone makes in moving to the tone immediately above or below. This transition is not logically divisible, just as the shading of a color from light to dark is not divisible. It can be defined as stages of steps, that is, by quarters, eighths, and so on, of a tone; but in doing so the *dynamic continuity* of the pitch will be broken.

Dynamic continuity: here is the essence of Enharmonicism. This is what distinguishes it from the music of the diatonic-chromatic system, which might be called rather, *Intermittent dynamicism*, or more exactly, *Fragmentary dynamicism*.

Now, if a series of dots serves to indicate the stages and steps of sound in the diatonic system, what else could indicate the continuity of this sound but the line? Thus, we relate exactly the value of the dot (fixed or static principle) and the value of the line (dynamic principle) to express the values of the diatonic system in relation to

the enharmonic system, and to represent them in a logical and perfect system.

The unfolding of the line, therefore, its rising or falling on the lines of the staff, will indicate to us in a logical, easy, and immediate fashion the unfolding, the rising or falling of the pitch of the noise-sound.

The length of this line, enclosed between vertical lines, will give us the length or duration of the sound itself. Its absence will indicate rests, likewise limited by vertical lines according to their duration. Indicating the unfolding of one or more sounds, these lines form an arabesque that immediately describes the typical physiognomy of a given composition, making its reading easy and rapid, easier and more rapid than with the present notation. For while the whole note or the half note is not longer for the eye than the quarter note or the eighth note, in this new notation a whole note (that is, the value of time corresponding to the whole note) is better represented, since the line is actually longer than that of a half or an eighth note.

Thus, in the new notation we will have:

Instead of empty or filled dots that indicate the notes, a line that we will call the note-line, running on the five staff lines and indicating the pitch according to the line or space on which it is written.

The reader will always be referred to two clefs, the treble or G clef, and the bass or F clef, which will be written at the beginning of the staff. This staff will be intersected by thin vertical lines (like those which presently indicate the measure) which will show instead the quarters of the measure, and by lines likewise vertical but thicker (or rather, by two close thin lines) which indicate the measures.

For subdivisions of time less than the quarter of the measure, once again vertical lines are used, but shorter ones than those that show the quarter of the measure.

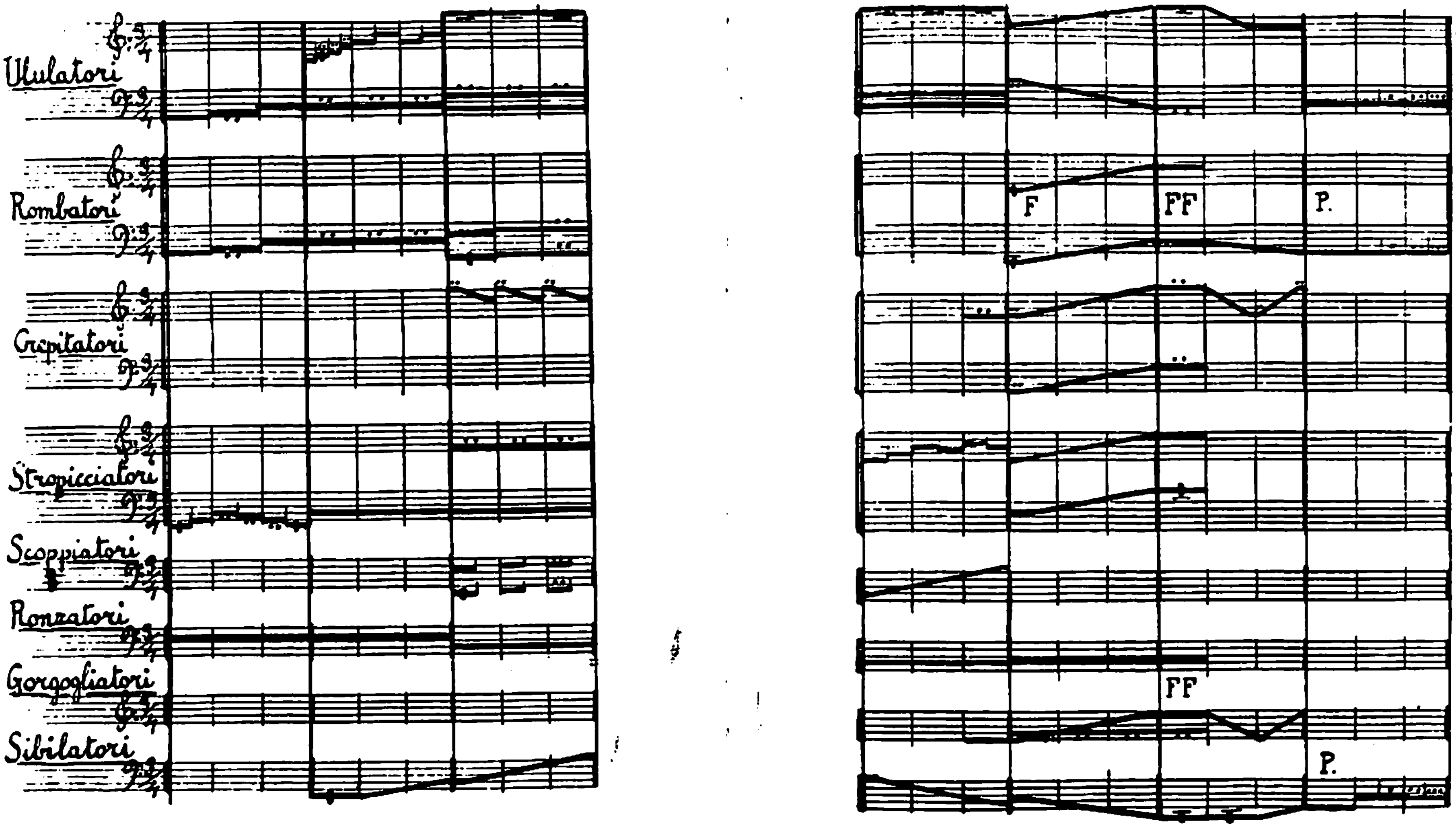
The note-line can naturally extend beyond the staff to show notes that lie above or below the staff itself. These notes can be identified by means of the usual small horizontal lines that are presently written as slashes through the head of the notes and as slashes through the stem. For greater clarity, notes that are above or below the lines and might have a slash through their head will be indicated by a little bar that crosses the note-line.

Imagine now a note-line that starts from the first-line E and rises to the fourth-space E (treble clef). This line will therefore indicate all the intermediate tones and semitones, and not only these but all the divisions of a tone. That is, it will show graphically in an exact manner the complete dynamic shading of the entire octave.

There still must be a graphic means of indicating the divisions that can be established between one tone and another. We can divide the tone into four parts. The method of indicating these quarter tones will be dots, placed above if we need to raise the note, or below if we need to lower it. A dot will indicate a quarter tone. Two dots will indicate two quarter tones, that is, a semitone, corresponding to the sharp or flat. Three dots will indicate three quarters of a tone.

If it should then be desired to divide the tone into eighths, a small number placed above or below the note-line may be used. This number always denotes the numerator of a fraction whose denominator is 8: thus, a 3 means 3/8, a 5 means 5/8, and so on. With this system we can therefore indicate any fraction of a tone and at the same time show in an exact graphic manner the *dynamic continuity* and the possibility of a greater variety of timbres are the two most important conquests realized by the noise instruments in the command of expressive means. The two pages of enharmonic music reproduced here, taken from *The Awakening of a City*, will give a clear idea of the new notation I have created.

Dal « *Risveglio di una città* » per Intonarumori. - L. Russolo



CHAPTER NINE

The Noise Instruments

So far, I and Piatti have invented and constructed 21 noise instruments. Studies and tests have already been made for many more, so that the orchestra of noise instruments will soon be enriched with new timbres and new families.

Here is a list of those already constructed:

3 HOWLERS (*Ululatori*)	1st: low	2nd: medium	3rd: high	
3 ROARERS (*Rombatori*)	1st: low	2nd: medium	3rd: high	
4 CRACKLERS (*Crepitatori*)	1st: low	2nd: medium	3rd: high	4th: very high
3 RUBBERS (*Stropicciatori*)	1st: low	2nd: medium	3rd: high	
2 BURSTERS (*Scoppiatori*)	1st: low	2nd: medium		
2 BURSTERS	Different from each other and from the preceding two			
2 GURGLERS (*Gorgoliatori*)	1st: low	2nd: medium		
1 LOW HUMMER (*Ronzatore*)				
1 LOW WHISTLER (*Sibilatore*)				

Externally, the noise instruments take the form of boxes of various sizes, usually constructed on a rectangular base. At the front end, a trumpet serves to collect and reinforce the noise-sound.

Behind, there is a handle to produce the motion that excites the noise.

On the upper part, a lever with a pointer is moved along a scale graduated in tones, semitones, and fractions of a tone. Through its displacements, this lever is used to determine the highness, that is, the pitch of the noise, which can be read on a graduated scale.

In some instruments, however, the motion being produced electrically by means of a small current of 4-5 volts provided by a pile battery or a storage battery, a switch in the form of a button is substituted for the handle. With either the handle or the button the noise can be interrupted at will, thereby obtaining any rhythm.

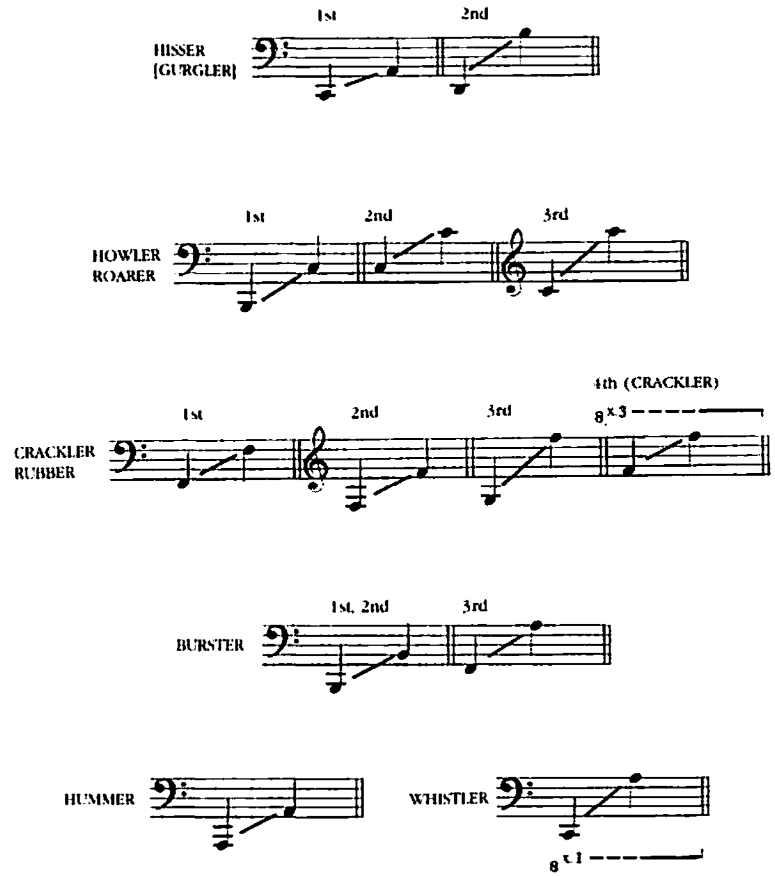
The noise instruments are played by gripping the lever with the left hand and turning the handle, or pressing the button, with the right. By adjusting the lever, the pitch is changed as desired, with any possibility of change—not only leaps of tones and semitones but also gradual enharmonic passages between one pitch and another. To produce the latter, it is only necessary to move the lever gradually up or down. The speed of the motion determines the length of the enharmonic passage.

Moving the handle more rapidly or less rapidly produces a greater or lesser intensity in the noise: thus, soft and loud passages can be obtained.

In some instruments supplementary levers, or better stops, change the timbre of the noise, allowing some interesting and curious variations. In the gurglers, a noise like the gurgling of water in the pipes of a gutter is transformed by pushing a stop to become another noise like the roaring of rain. In the burster, there is a stop that transforms a noise like the motor of an automobile in motion into the noise of the same motor running with the automobile at rest. There are two stops in the whistler to change its noise, which resembles the whistling of the wind (a closed, low and distant timbre). The first stop adds the sharp and nearby whistling that the wind makes through the cracks of doors and windows. The second stop adds the roaring hiss of water that often accompanies the wind and follows its pitch, as we have seen in analyzing the noises of nature.

The range of the instruments is varied. The low pitches were more easily obtained, and thus, some instruments produce very beautiful and intense basses. The same is true of medium pitches. Greater difficulties had to be overcome in attaining high pitches. Very high pitches turned out to be extremely difficult to obtain.

Here I give a table of the ranges of the different noise instruments.



Such were the ranges of the noise instruments used in the concerts at Milan, Genoa, and London. Later studies have added an additional octave higher in the following families: Howlers, Roarers, Cracklers, and Rubbers. All these instruments have an additional octave, whether in the low, the high or medium ones. It is not improbable that this range could still be increased. It is already sufficient, however, to obtain a great variety of pitch.

And now, not wanting to get into a description of the noise instruments and the various simple but varied mechanisms with which the different noises and their gradations of pitch are obtained, I will give instead a concise summary of the different types of noise that they produce.

The HOWLERS (*Ululatori*) are the most musical of the noise instruments. The howling that they produce is almost human; and while they recall the siren to some extent, they are also a little like the sounds of the string bass, the cello, and the violin. In a certain sense, they could be substituted for each other, the low howler for the string bass, the medium for the cello, and the high for the violin.

In addition, they have an advantage over their brother instruments in the traditional orchestra, being able to hold a note as long as desired without a change of bow, which produces not only a suspension (or better, modification) of timbre but also a rhythmic renewal in the held note.

The howler is a mysterious, suggestive instrument that takes on an intense expressiveness in various enharmonic passages and offers many resources, being capable of the most perfect intonation.

The ROARERS (*Rombatori*) produce a full, round, and very musical noise, which in the low roarers resembles the distant rumble of thunder. They have a timbre quite rich in harmonic sounds, pleasing and assonant. Very strong and audible among them, especially in the high roarer, is a sound a sixth above the fundamental. This sound gives a very curious effect to enharmonic passages, as of tones that are continuously recurring, an effect that is fascinating and mysterious in the low roarers, and in the high ones, gay, playful, and humorous.

The CRACKLERS (*Crepitatori*) produce a metallic crackling for which it is difficult to find an analogy. They have great intensity, easy and perfect intonation, and a timbre rich in harmonic sounds, offering very great resources, especially in the variations of intensity in the high cracklers, which can produce a high-pitched grunting like a pig being skinned, or just as well, a very sweet and controlled tinkling, staccato and silvery.

The high crackler lends itself magnificently to very effective solo passages. It is perhaps the instrument on which the greatest virtuosity is possible.

The low ones, however, produce an effect like the clashing of metal shaken with confusing speed, or a clarity and dryness that is truly crackling.

The RUBBERS (*Stropicciatori*) have a timbre of metallic rubbing, are quite rich in not always assonant harmonics, are less forceful than the cracklers, have fewer virtuosic resources, but have a curious metallic timbre that is very useful when joined with that of other instruments, with which they blend very well. In the orchestra, they represent a *trait d'union* between the cracklers and the roarers.

There is a variety of BURSTERS (*Scoppiatori*). Two produce noises like the bursting of objects that break and shatter. The other two make a noise similar to that of a gasoline engine. I have already mentioned the great variety of intensity in the sound of these last two (controlled by means of a stop) whose timbre is like that of motors in a moving automobile, with or without exhaust, or even with the automobile standing still and the motor running.

In these instruments, the effect of rising or falling enharmonic passages, with faster or slower repercussions (controlled with the handle) produce a perfect illusion of the speeding up or slowing down of one of those motors whose noise is so sympathetically known to our ears, those motors that push automobiles, motorboats, and airplanes to such intoxicating speeds.

The HUMMER (*Ronzatore*) has a sweetly harmonious noise-sound, full of fascination and recalling the humming of dynamos and electrical motors, whose curious sound fills the great electrical centers and is always associated in our minds with the vision of great, gleaming, very modern and marvelous factories. The timbre of the hummer includes some very charming harmonics, the fifth above, the octave, and its third, over the fundamental.

Here, an observation should be made about the harmonics that the noise instruments produce.

Harmonics are generally understood as sounds above the fundamental that are produced by the presence of other vibrations, faster and shorter, that exist along with the principal vibration. In instruments whose noise-sound is as complex as that of the noise instruments, however, the fundamental has to be understood as the *loudest* pitch that the ear perceives. There may be sounds lower but *weaker* than that which defines pitch. And the one that characterizes the pitch for us may be nothing other than a harmonic of a weaker and lower fundamental (with regard to the vibrations).

The WHISTLER (*Sibilatore*) makes a sound that imitates perfectly the whistling of the wind with all its variations. It produces a timbre very rich in harmonics, which can be increased by means of the first stop, which allows the production of an entirely new group of harmonics. To this timbre a second stop adds the characteristic hissing noise of the rain. It is an instrument with a large variety of timbres, many resources, very beautiful enharmonic passages, mysterious and full of strange fascination, round and full harmonious low sounds, and charming high harmonics. It is certainly one of the most successful and complete of the noise instruments.

The GURGLERS (*Gorgoliatori*) produce a complex timbre, like water running through a rain gutter, with its metallic and curious rhythm. By means of a stop, it can make the hissing noise of the rain. Although it has an apparently weak timbre, it is one of the instruments most easily distinguished in loud passages. It may even be heard better at a distance than nearby—and least of all by the performer who stands behind the trumpet. This last effect, common to all the noise instruments, is most pronounced in the gurglers.

The gurglers have a group of harmonics that correspond in a certain way to the minor tonality. The interesting contrast that is heard between this minor tonality and the curious rhythm makes up the complexity of its noise.

As I have already said, many other instruments will later increase the family of these even-now varied noise instruments. The orchestra is continually in evolution and can be amplified infinitely, since nature and life offer us in noises a variety of timbres that will not be easily exhausted. It is a matter of time and work to resolve the problem presented by the construction of new noise instruments. The most important of these difficulties is that of enharmonic possibilities, since I want *all* of the noise instruments to have *all* enharmonic possibilities, just as those already constructed. Indeed, the conquest of enharmonicism brought about by the noise instruments is one of their greatest values.

Thus, beyond enlarging the field of sound with new timbres, the noise instruments expand the chromatic-diatonic system without destroying it, since they add to its possibilities all those of the enharmonic system—new, alive, and thrilling.

CHAPTER TEN

The Orchestra of Noise Instruments

The reader who has followed the analyses of the different timbres of the noise instruments may still be unconvinced of the qualities of these instruments, or of the value of every single noise instrument. He will still be the slave of the old prejudice that noise cannot be musical.

Actually, my analysis of the noise instruments has been somewhat MODEST. The qualities of these instruments are *superior* to the claims that I have made for them. Everyone who has been able to hear them not only in the more or less stormy concerts but also in the quiet and calm of a private room, everyone who has heard them one after another and has been able to assess their various possibilities and timbres has unanimously confirmed the fascination, the beauty, and the novelty of the emotion that they evoke.

And bear in mind that all these instruments together, far from making a disagreeable or cacophonous mixture of deafening noises, can produce instead very charming combinations, full of fascination and mystery, and at the same time an amazing musicality, even in the loudest passages. I must admit, however, that in order to obtain this result the performers must be already well trained and practiced on the instruments, and must watch their intonation carefully (something necessary in any orchestra). I have been able to obtain this perfect result only in Milan, where (unhappily) the bestiality of the audience did not allow a single bar to be heard!

I insist upon the charm of certain combinations of the noise instruments, since it is the last thing you might imagine in regard to these instruments. But to appreciate this quality, the most absolute silence is necessary in the hall. No one can imagine what charm is attained with harmonic modulations and held chords produced, for example, by the blend of low and medium howlers, low whistler and hummer. What a marvelous contrast results if a high crackler suddenly enters above this group to inflect a theme, or a gurgler to hold some notes or point up the rhythm. It is an effect that is absolutely unknown in orchestras, since no orchestra but that of the noise instruments can produce this sensation of excited and pulsing life, exalted through the intensity and rhythmic variety found in the combination of roarers, bursters, cracklers, and rubbers.

I have added to my orchestra (and found the addition very useful) two tympani, a sistrum, and a xylophone, whose clear dry timbres make an interesting contrast to the complex timbres of the noise instruments.

This is the opportunity to touch on the question of the possibility of adding the noise instruments to the conventional orchestra. Since the musicality of the noise instruments is incontestable and their intonation perfect, it is logical and natural that they be joined to the conventional orchestra. The first avant-garde composer to realize this union was my dear friend and fellow futurist, Pratella, in his opera, *Eroe*. It is certain that others will want to follow the example of Pratella (several composers have already requested authorization from me).

I look forward, nevertheless, and have always looked forward to completing and enlarging an orchestra composed entirely and uniquely of noise instruments. The stimulus to do so is the more than satisfactory result obtained so far. The orchestra of noise instruments is and must remain a thing apart, complete in itself.

One of the reasons that spurred me to enlarge the field of orchestral timbres by borrowing them from noises was precisely the *boredom that our ear feels* in hearing the now commonplace timbres of the orchestra and the virtual impossibility (encountered in even the most advanced modern orchestrators) of creating *new* combinations from the paltry and outworn timbres that ordinary orchestras offer. Who can hope to discover any new emotions in these instruments? The only emotion that they can still produce is that of widening the mouth—into an inevitable yawn! And the yawn is not exactly the newest of emotions.

The amazement produced by the absolute novelty of timbre and the fact musical timbres made from noises produce a complexity of sensations that is *new for the ear* are the source of the profound emotion felt in listening to the orchestra of noise instruments. The

complicated timbre of noise, through the richness of its harmonics, has an indeterminacy whose composition the ear intuits but cannot account for, so that it is difficult to tire of it. When a sensation has become commonplace for our senses, when our senses grasp it perfectly, when it can reveal no more hidden elements, *this sensation no longer gives us any emotion*. A hearing of the orchestra of noise instruments, even after many repetitions, still has new emotions to give us because our senses cannot so easily bare the elements that compose it. And thus, in the involuntary search for such elements there are ever new characteristics to discover and clarify, the interest remains ever alive, the attention ever receptive.

I must still say a few words about the possibility of realizing the complete capabilities of the orchestra of noise instruments through the performer. The noise instruments, as I have said, have a graduated scale that indicate the various points through which the lever is moved to obtain the different tones and semitones. Despite this, it is easy to see that they are instruments of free intonation. Above all, the ear must know the pitch is right, and the hand must become accustomed to certain movements of a certain size, in order to change immediately to the right pitch. The same is true of the violin, the cello and the bass. It is helpful in choosing performers, therefore, to look for musicians already accustomed to playing instruments of free intonation, since their ear is generally more alert and sensitive to perfect intonation.

However, a performer who is even a little receptive and intelligent is able to acquire in a few rehearsals a sufficient command of the instrument to enable him to play with adequate intonation. I remember, for example, that when I prepared the Dal Verme concert in Milan, at the fifth rehearsal the beginnings of a decent performance were already audible. At the seventh and eighth rehearsals, the performance became good; at the eleventh, it was excellent.

If then, as I am certain, the orchestra is enlarged so that each of the performers will have his own instrument to practice on at home, very good performances could be obtained with only a few rehearsals. And it may even be possible to have performers that are capable of that virtuosity which is so detestable when it has artistic pretensions but so very useful in an orchestral performer.

I have reduced the difficulty of reading enharmonic passages as much as possible by using the system of notation that I have described only and exclusively for passages that require them. For instance, everything that was not enharmonic I wrote with the usual notes. The note-line, whose length was determined by the quarters necessary to complete the measure, was used only in enharmonic passages. If it was longer than a measure, this was indicated by the vertical lines. The reading of this turned out to be very easy for everyone.

As can be seen, the difficulty of performances with the orchestra of noise instruments is not so great as it would seem at first sight. The only great difficulty seems to be the bestiality of the public that does not want to hear it. But let us hope, or rather, firmly believe, that we can overcome even this.

CHAPTER ELEVEN

The Art of Noises
New Acoustical Pleasures

The evolution of music, moving toward ever greater *complexity* (as I pointed out before in my manifesto The Art of Noises) in rhythm, in ever more complicated and dissonant harmonies, and in ever more unusual orchestral colors, is a convincing proof of the absolute need of our sensibility to change the sensations received by our ears. This continuous and necessary force of change has always been constant in its direction toward the *more complex*. And for every new leap forward by innovative musicians, the inevitable protests of the public have burst forth, and the just as inevitable disapproval of the knowledgeable critics.

None of this hostility was ever capable of stopping the fated evolution of music. In a sudden change of climate, the most contested of new manifestations ended by being accepted and applauded. Certain forms that at first excited astonishment and indignation were not long in being heard with indifference, as logical and natural. Who is amazed anymore at the famous dissonant chord of Beethoven's *Ninth Symphony*? Who still thinks Berlioz' fortissimos are too loud? And are not the most recent discoveries of Debussy and Strauss now accepted by the majority, having become logical and normal for our ears?

The reason for these instances of rapid acceptance lies in the fact that our acoustical sensibility is being continually assaulted by the diversely dissonant chords and the much more complicated timbres found in the noises of life and nature. And more decisive in music than any other art is the importance of their usefulness and role in supporting certain given sensations for the senses (considered in their physiological essence).

The soul cannot feel pleasure when the sensation that should have produced it has actually given pain to the transmitting sense. Thus, it would not have been possible for music to evolve so decisively toward dissonance if our ear had not become accustomed to the complex noise of fervid, rapid and intense modern life. But although they suffer upon receiving violent emotion to which they are not accustomed, our senses take almost no notice of those that are on the contrary too familiar to hear. And this is why in modern music the search for timbres and orchestral colors obtained through the strangest and most artificial dissonances has now become a dominant and constant concern.

In modern music everything is sacrificed to this search while the former concerns, style, line, and form, are now completely ignored. Nevertheless, none of these new effects that can be obtained with the conventional orchestra turns out to be anything that astounds our ear once it has become indifferent to dissonances.

Now, it is absolutely impossible for a composer to move the soul without first moving the ear. (It must be understood that I am not alluding to the soul of a seamstress or a hairdresser but to that of an artist, or at least to that of an evolved and truly modern man.) And in this circumstance, which only innovators take into account, lies the pitiless condemnation of all those who believe that music can be made by repeating the usual sentimental strumming, the usual melodic cliches, and the usual melodramatic situations with violin solos and trumpets.

Stir the senses and you will also stir the brain! Stir the senses with the unexpected, the mysterious, the unknown, and you will truly move the soul, intensely and profoundly! Here lies the destined and absolute necessity of borrowing the timbres of sounds directly from the timbres of the noises of life. Here—with the sole exception of the meagerness of orchestral timbres—lies the unbounded richness of the timbres of noises.

But it is necessary that these noise timbres become *abstract material* for works of art to be formed from them. *As it comes to us from life*, in fact, noise immediately reminds us of life itself, making us think of the things that produce the noises that we are hearing. This reminder of life has the character of an impressionistic and fragmentary episode of life itself. And as I conceive it, *The Art of Noises* would certainly not limit itself to an impressionistic and

fragmentary reproduction of the noises of life. Thus, the ear must hear these noises mastered, servile, completely controlled, conquered and constrained to become elements of art. (This is the continual battle of the artist with his materials.) Noise must become a prime element to mould into the work of art. That is, it has to lose its accidental character in order to become an element sufficiently abstract to achieve the necessary transformation of any prime element into abstract element of art.

And so: although the resemblance of timbre with natural noises may be attained by my noise instruments, even to the point of deceiving the ear, the noise, as soon as it is heard to change in pitch, loses its character of *result*. It is no longer an *effect* bound to the causes that produce it (motive energy, striking, friction through speed, bumping, and so on) owing to and inherent in the purpose of the machine or thing that makes the noise. And since the noise is freed from the necessities that produce it, we dominate it by transforming at will its pitch, its intensity and rhythm. We hear it suddenly become autonomous and malleable material, ready to be moulded to the will of the artist, who transforms it into an element of emotion, into a work of art.

This lyrical and artistic coordination of the chaos of noise in life constitutes our *new acoustical pleasure*, capable of truly stirring our nerves, of deeply moving our soul, and of multiplying a hundredfold the rhythm of our life.