Pedalling Liszt's Works on the Modern Piano

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Abstract

The purpose of this study is to discuss the problems that occur when some of Franz Liszt's original pedal markings are realized on the modern piano. Both the construction and sound of the piano have developed since Liszt's time. Some of Liszt's curious long pedal indications produce an interesting sound effect on instruments built in his time. When these pedal markings are realized on modern pianos the sound is not as clear as on a Liszt-time piano and in some cases it is difficult to recognize all the tones in a passage that includes these pedal markings. The precondition of this study is the respectful following of the pedal indications as scored by the composer. Therefore, the study tries to find means of interpretation (excluding the more frequent change of the pedal), which would help to achieve a clearer sound with the effects of the long pedal on a modern piano.

This study considers the factors that create the difference between the sound quality of Liszt-time and modern instruments. Single tones in different registers have been recorded on both pianos for that purpose. The sound signals from the two pianos have been presented in graphic form and an attempt has been made to pinpoint the dissimilarities. In addition, some examples of the long pedal desired by Liszt have been recorded and the sound signals of these examples have been analyzed. The study also deals with certain aspects of the impact of texture and register on the clarity of sound in the case of the long pedal. In conclusion, the study suggests some solutions for reducing unclear sounds on the modern piano.

Keywords:
Acoustics of the piano, Clarity of sound, Franz Liszt, Historical piano, Pedal markings, Pedalling.

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PREFACE

The idea to write about the realisation of Liszt's pedal markings arose after I started to study and perform his late piano music. In addition to the innovations in harmony, structure and form, in his late music we can also find many pedalling indications that do not follow the traditional principles of pedalling. During this period, Liszt wrote some long pedal markings, which would have produced interesting sound fields on the pianos of his time. In these sound fields, we can furthermore recognise and separate all the single tones played with the pedal. If these pedal markings were to be realised exactly in the same manner on modern pianos, this would reduce the level of sound clarity. In some cases, following the original pedal indication on a modern instrument would produce such a blurred sound that we might not even recognise all the tones from the mass of sound. My respect for the composer's pedal indications was too great to ignore them. I have instinctively tried to avoid the blurred sound by reducing the degree of the pedal. Therefore, my intention in starting this study was to find confirmation to my supposition that a partially depressed pedal would actually make the sound of a modern piano clearer. During the writing process, I also gradually became interested in the question: Does the pianist have any other means for reducing the blurred sound than a partially depressed pedal?

In addition to minimising the blurred sound caused by the long pedal, I was also interested in identifying the elements that cause the differences between the sound of modern and old instruments. A verbal description of the dissimilarities of sound on different pianos would be quite subjective and probably inaccurate. Therefore, it would be preferable to identify these dissimilarities of sounds on the basis of some physical (acoustic) parameters. It should be mentioned that acoustics and its terminology were rather unfamiliar to me, as is probably the case with most pianists. My intention is

not to write a comprehensive study on the acoustics of musical instruments, but rather to find a solution for interpretation to reduce the blurred sound on the modern piano. Thus, I will attempt to limit the use of acoustics terms as much as possible and will deal only with the most important ones.

In order to discuss the sound properties of historical instruments, one should have some experience with the playing on them. In 1995, I had the possibility to visit the Liszt-Museum in Budapest and had the unique opportunity to try out the historical pianos owned by Liszt. For me it was an unforgettable lesson in the history of music instruments. A year later, I had the opportunity to procure an old, beautiful-sounding Steinway grand piano made in ca. 1890. We know that Liszt had a Steinway grand made in 1882 in his piano collection. Even though the pianos of this firm underwent some small improvements during the intermediate 8 years, playing on this instrument has kept me in constant touch with historical pianos and their sound.

This study could not have been written without the contribution and assistance of a number people. I would like to thank Prof. Marcus Castrén and D.Mus. Margit Rahkonen who have made invaluable comments and suggestions on this research. Ph.D. Hanna Järveläinen gave me important insights on the chapters dealing with the aspects of acoustics. For that great occasion to play and record on the marvellous instruments of the Liszt-Museum I am very grateful to Dr. Maria Eckhardt. Many thanks belong to Prof. Glenda Goss, M.Mus. Eibhlin Griffin and D.M.A. Iris Messinger, who have corrected my English language. Prof. Liisa Pohjola, Prof. Kari Kurkela and the DocMus department have assisted me with significant moral and practical support throughout these years. I would also like to express my gratitude to my family for their patience.

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"*His* [Liszt's] touch and his peculiar use of the pedal are two secrets of his playing…"

Adelheid von Schorn

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INTRODUCTION

1.1 THE BACKGROUND OF THE STUDY

Every pianist who is experienced with pianos built in the 18th and 19th century knows that the sound quality of the historical piano differs quite remarkably from that of the modern one. The further back in the development of the piano we go the more this difference becomes evident. Changes appear both in the construction as well as in the acoustical properties of the instrument. It is logical that when the construction of the piano continued to develop this was also reflected in the properties of the piano's sound. When performing the works of earlier composers such as J. S. Bach, J. Haydn, L. van Beethoven etc., the pianist has to compromise the authentic sound quality of the pianos the composers used, and the actual sound possibilities on the given instrument. Not every pianist has access to earlier instruments. From the performer's perspective the decisions regarding original tempos, dynamics etc. are more problematic and are a matter of interpretation, especially when no recording of present composers has survived.

The subject of discussion cannot only be the use of the pedal in works of earlier composers when performing them on a modern piano, but also on a historical instrument. The reason for this is that originally only a small part

of the intended pedalling was written into the score. A different situation arises when pedal markings have been fixed by the composer. If the pianist's purpose is to achieve as authentic a pedal effect as possible, he would have to research the pedal's acoustical differences on old and modern pianos. Only afterwards would he be able to consider how to minimise these dissimilarities. Usually, these decisions are based on one's own experience and on aural considerations. Sometimes the pianist's solutions may even happen subconsciously.

Playing piano works from the 19th century may sometimes raise questions about the appropriate frequency of pedal changes. If the composer has not written pedalling into the score, its use depends on many factors that include the relation of melody tones to the tonality, the acoustics of the room, the register where the melody is placed etc. When the melody is located in a high register, the pedal may be depressed during a larger number of melody tones. A melody located in the bass requires more frequent changing of the pedal. Additionally it seems that modern musical aesthetic prefers more exactness and clarity of sound when compared to the 19th century. The same trend is valid also in piano playing, including the pedalling. Thus, according to the modern principles of interpretation, the pedal would be changed more frequently during long melodies.

Composers, intending some specific sound (pedal) effect, have also taken into consideration the acoustical properties of the instrument in their use. Probably no composer would deal with the question regarding how his work would sound on a future instrument. The fact is that the piano has seen remarkable development since Liszt's lifetime. A pedal effect, which would work on an historical piano, would not necessarily work on a modern instrument. On other hand, both the taste and esthetical principles of audiences have changed since Liszt's time. It is possible that Liszt's pedallings in his late music may have sometimes been misunderstood in his lifetime although such acoustical (pedal) effects were specifically composed, tested and intended on pianos of Liszt's time. The pianists of today's century use modern pianos, which are not always appropriate for realising certain pedal effects. Nevertheless, they may appreciate more innovation in Liszt's music. Thus, whether or not the pedal effect would work on the modern piano remains subjective.

In the late piano works of Liszt, the composer indicated a number of pedal remarks. Most of them follow the normal pedalling practice of the time. If

Liszt had not written those indications, the majority of pianists would probably use similar pedalling to the original indications. Nevertheless, some exceptional and untraditional pedal indications can be found in the late piano works of Liszt. In most of these cases, the pedal has to be kept down over a long period of time, some of which may be complicated by chromatic passages or melodies in a low register. It seems that his idea was to create some special sound field. When realising such pedalling on a modern piano, the result may be a confused sound event and it would be impossible to recognise the sound properties. One of the typical examples of such a pedal effect is *Marche funèbre* from the piano cycle *Années de pèlerinage III*).

Although the exact realisation of some pedals scored by Liszt may sometimes cause problems on a modern piano, no one presumes that using a historical instrument should be obligatory. In the 20th century there has arisen an interest in old instruments and performing early music on them. It seems that the subject of interest has been mostly the interpretation of Viennese classics, baroque and earlier periods of music history. The discussion about the use of period instruments for the performance of music from the so-called romantic music period has gotten much less consideration. With the exception of a few recordings, the piano music of Liszt is rarely performed on historical pianos. There are many reasons for that. Liszt's piano works play a central role in pianists' repertoire today. Most performances of this music happen in concert halls and recording studios, in which only modern pianos are available. In addition, not enough original instruments have survived. Unlike the harpsichord, for instance, the copying and building of massive, ornamented old pianos has not been a subject of interest for modern piano makers. Thus, when realising such problematical pedals in Liszt's repertoire, today's pianist has to manage to solve these problems on a modern piano.

1.2 THE PURPOSE OF THE STUDY

Based on my practical experience, the sounds of pianos built during Liszt's time and that of the modern one are dissimilar. When observing long pedal effects this difference will be detected not only in the quality of the sound, but also in its clearness. Similar pedalling played on a historical instrument may cause a confused and blurred sound effect on a modern instrument. In realising such unusual long pedals in earlier practice, I have sometimes used

a partially depressed pedal. Another solution to avoid such confused sound when playing on the modern piano has been to release the pedal more frequently than Liszt intended. I have practiced this solution only in the case of extremely problematic pedals. The pedal vibrato would also be a considerable way to minimise this unclear sound, but this seems to be a combination of two previously mentioned solutions. Naturally, the more experience the pianist has realising problematic pedal indications, the more often his solutions in achieving clarity of sound will happen subconsciously.

The intention of the present study is to find some solutions that would help to make the acoustical properties of uncommon long pedals played on a modern piano more similar to the historical instrument. In addition to that, the pedalling should not be in conflict with the score. The supposition of the present study is that Liszt accepted the acoustical result of these pedal effects on pianos he used. Thus, a more frequent change of pedal than has been scored may disguise some acoustical effects intended by Liszt. Since the sound qualities of pianos built during Liszt's time and in the present time are not alike, the goal would not be to achieve a similar sound on both a modern instrument and the historical one. The intention of the realisation of Liszt's pedal effects on a modern piano is to achieve a similar level of sound clarity with a historical piano. This goal, too, would be quite difficult to realise. Thus, the most realistically obtainable task for the pianist would be to minimise these acoustical differences when pedalling on the modern instrument.

The present study will attempt to determine the sound dissimilarities of pianos made at different times. For the analysis of sound dissimilarities between pianos I have played and recorded single tones on both instruments. For the recording tones are chosen from three different registers: in the bass, in the middle and in the treble. All sound examples of single tones have been played both with pedal and without. For studying the influence of a partially depressed pedal on the sound in case of modern pianos I have also recorded the same tones played with 1/2- pedal, 1/4-pedal and 1/6-pedal. To analyse the sound properties of Liszt's written pedal effects in the case of different pianos, I have recorded some sections from Liszt's late works, in which such pedal effects can be found. Because most of these untraditional pedals were written by Liszt during the last decade of his life, the pedal markings studied in the present research are limited to the late works of Liszt. Another reason for this limitation is the relatively large number of pedal indications used

during Liszt's late period, and the more systematically scored pedal indications written at this time.

In addition to the pedal effect caused by a long pedal, the present study will also discuss the effect caused by the release of the pedal. These effects can be found in situations where several chords have to be played with a long depressed pedal, in the work *Aux cyprés de la Villa d'Este I* from *Années de pèlerinage III*, for instance. Here the pedal must be quickly released. During and after the pedal's release, the fingers should hold some piano keys down. As a result of this pedal's release, the sound will lose its massive volume and intensity in a very short amount of time. On these occasions, there is an unexpected dynamic contrast between the moments before and after the pedal's release. In my opinion, in most cases Liszt himself did not intend such a sudden decrease in sound intensity. According to my experience playing such pedal effects, the contrast is more pronounced in a modern piano than a historical instrument. This is the reason why the study will also deal with effects caused by the pedal's release, although the realisation of this kind of pedal effect would neither cause a blurred sound nor would there be any problems determining the sound's acoustical properties.

The study consists of a brief overview regarding the history of the piano, the development of the pedal and the history of pedalling (Chapter 2). This part will also discuss the development of Liszt's musical style**.** This will be followed by a chapter dealing with documents and contemporaneous comments about Liszt's use of the pedal. Chapter 3 will analyse pedal markings written by Liszt. Acoustically the most problematic pedals will also be categorised. Chapter 4 will concern some matters of acoustics in general. Separately, some aspects of the piano's acoustics will be handled. The sound of pianos from different periods will be analysed in Chapters 5 and 6. The first one (Chapter 5) consists of the analysis of a single tone and the second one (Chapter 6) considers the analysis of pedal effects written by Liszt. In the analysis of the sound, the following computer applications have been used: SoundDesigner II, Signalyzer, Alchemy, Canary and Audiosculp. The last main chapter (Chapter 7) of the study discusses possible solutions in realising Liszt's pedal effects on the modern instrument. In formulating these suggestions, the results of the sound analysis treated in Chapters 5 and 6 have been used.

Although the majority of this research consists of the analysis of acoustical properties of sound, this study does not pretend to be on a level with

scientific acoustics. Since this study will suggest some solutions for realising some problematic pedal markings of Liszt, it has been intended for pianists, rather than for experts of acoustics. The study will briefly treat only the most necessary terms and matters regarding acoustics. In many cases, the observations based on my practical experience of pedalling have resulted in acoustical analysis intended for confirmation or further analysis.

1.3 PREVIOUS STUDIES

Joseph Banowetz writes in his preface to *The Pianist's Guide to Pedalling*:

> "Anyone writing about pedalling takes the proverbial tiger by the tail …" (Banowetz 1985: vii)

Speaking about the realisation of the pedal in general, there is no one correct way to do it. The use of the pedal depends on many factors such as the piano's construction, the acoustics of the room, the pianist's ability to be an artistic and creative musician, the situation of the performance etc. Accurate pedalling requires the pianist's active listening to the sound result and an extremely rapid reaction to it. Thus, a written guide to pedalling may normally not present any absolutely fixed and final solutions. The exact description of the vast amount of details concerning pedalling cannot practically be expressed in words. Those may be the reasons why the authors of piano schoolbooks and tutors have not dealt with the problem of pedalling more often.

The sources used for present study on pedalling may be divided into three main groups. The first includes historical reviews on the pedal and pedalling. A remarkable book in this category is *A History of Pianoforte Pedalling* by David Rowland. It discusses a number of historical documents that consider pedalling and the development of the pedal as a device of the piano. As the word *pianoforte* in the title refers, the study treats mostly pedalling in the 18th and 19th centuries. Thus, some comments about the pedalling of Liszt and his contemporaries are included.

The tutors considering the problem of pedalling practice belong to the second group. In most handbooks of this kind many important problems of interpretation has been discussed; pedalling is a part of the whole work. *Piano Technique* by W. Gieseking and K. Leimer and *The Art of Piano Playing* by Heinrich Neuhaus belong to this category. Neuhaus, for instance, has pointed out the importance of the pedal and its dependence on the performance conditions. According to him, the ear of the performer should decide the appropriate final solution for pedalling. In Neuhaus's book, there are many fanciful expressions on pedalling that are not necessarily helpful for pianist. He quotes pianist Anton Rubinstein, for example, who expresses that the pedal is the soul of the piano. On the other hand this kind of comparison seems to be expressed in the spirit of romanticism (19th century).

One of the most profound guides to pedalling is the above-mentioned book by Banowetz, which is completely dedicated to problems of pedalling. The author presents different pedalling techniques and their intentions (legato, syncopated, colour, partial etc.). Banowetz also discusses the pedalling style of different composers including Bach, Liszt, Debussy and others. Although this book deals with the development of the piano and pedal, differences between the old and new instruments have not been taken into consideration.

The third category of books includes the autobiography *My Life and Music* written by the famous pianist Artur Schnabel. In addition to reminiscences on his life, Schnabel discusses music and its aesthetics. Although his work does not pretend to be a piano schoolbook, it includes some suggestions about performance based on the author's own experience in piano playing. In Schnabel's writing the viewpoints are rather subjective. One cannot agree with some of Schnabel's comments on the realising of some of Beethoven's pedal indications on the modern piano. He writes:

> "I have played on the old pianos, I had access to the marvellous collections in Vienna and in Berlin. I have played on Bach's, Beethoven's, Weber's and other pianos. In Beethoven's case the effect of the pedalizations demanded by him was exactly the same on the old instruments as on the new ones." (Schnabel 1961: 135-136)

The fact that Schnabel does not find any difference between the pedal effects of Beethoven-time pianos and the modern ones, would suggest that the

curios pedal indications of Liszt would not cause any problems according to him. The fact is that the piano continued developing from Beethoven-time until Liszt composed his late works. Based on practical experience of listening and playing on Liszt-time and modern pianos the difference in pedal effects is evident. Thus, if the hypothesis of the present study (both the sound quality and the pedal's acoustical effect differ on historical and modern pianos) would be proven, the viewpoint of Schnabel would also have to be disputed. It should be remembered that Schnabel mostly played on pianos built before the mid-20th century, which were more similar to earlier instruments than pianos made towards the end of the 20th century. It is also possible that Schnabel just might have propagated the possibilities of the modern instrument, writing that the pianist could not have the same possibilities on the old ones than on a modern piano (Schnabel 1961: 136). In his sentence about "the effect of pedalizations" he would not necessarily distinguish between the acoustical phenomena of the pedal and its mechanical construction. This does not exclude the possibility that he reported on the similarity of pedal devices on instruments made during different periods. Schnabel's autobiography's characteristic subjectivity does not in any way diminish the value of this book. The present study has not used Schnabel's *My Life and Music* as a source in the traditional meaning, but takes some of his views with some reservations.

Different authors have written books about Liszt as a person and as a musician. Two main sources for the present study, dealing with the music of Liszt, are *Franz Liszt* written by Peter Raabe and *The Music of Liszt* by Humphrey Searle. These books differ in their structure and contents. Raabe has divided the chapters of his study based on genres of music. In his book, he also discusses articles written by Liszt. Searle's research on Liszt's works is ordered chronologically. Other sources on Liszt's life, used in the writing of this study, are Alan Walker's comprehensive *Franz Liszt* (in 3 volumes) and *Portrait of Liszt by Himself and His Contemporaries,* written by Adrian Williams. The last one presents numerous interesting documents and comments about Liszt according to his contemporaries. Wilhelm Jerger in his book *Franz Liszt Klavierunterricht von 1884-1886 dargestellt an den Tagenbuchaufzeichnungen von August Göllerich* has completed and edited Liszt's comments to his students in piano lessons. Jerger's study is based on the diary kept by pianist A. Göllerich, who was also a student of Liszt.

Two main sources that have been helpful with the chapters on acoustics are *The Science of Sound* by Thomas D. Rossing and *Tone: Study in Musical*

Acoustics by Siegmung Levarie and Ernst Levy. Whereas the first study considers more the details of acoustics as a science, the second one places its emphasis on the acoustical properties of some musical instruments.

1.4 ABOUT THE TERMINOLOGY

Problems with terminology often arise when writing about music and the interpretation of a work. The use of the Italian language in the score has been traditional, but since the 19th century other languages (German, French, English etc.) have also played a remarkable role in musical terminology. Thus, the meaning of such terms also depends on the use of certain languages during different times and in different locations. Often some additional information gives the term a more exact meaning and its possible multiple meanings. The present study will not deal with all terms of music and acoustics, but only with those necessary for dealing with the pedalling of Liszt's piano works. For understanding the matters of sound analysis, it is important to consider the terms regarding the physical properties of sound. Because those specific terms require a more lengthy description, they will be discussed further in later chapters, which deal with the piano and its acoustical properties. By analysing sound, a consistent system is need for determining the different tones' names and frequencies of their partials. A table presenting names and frequencies of piano tones is presented in appendix I.

Both instruments used for the recording of sound examples are grand pianos. There are several different kinds of keyboard instruments (upright, pianino etc.) that have strings, hammers and keys. In the present study, under the name 'piano', only the grand pianos will be considered. The examples analysed in the present study are recorded on pianos made by Chickering[1] and Steinway[2]. By construction, this model of Chickering belongs to the so

[1] The grand piano made in 1867 (serial number 30.540), currently in the Liszt-Museum, Budapest. The American (Boston) firm *Chickering* was named after its founder Jonas Chickering (1798-1853). In 1867, this piano won a gold medal at the World Exposition in Paris. Emperor Napoleon III himself awarded Charles Francis Chickering a Légion d'Honneur, who then presented this instrument to Liszt in Rome for Christmas of 1867.

[2] This piano was made in Hamburg in 1990 (serial number 517.375), and placed for the recording session in the concert hall of the Sibelius Academy (Helsinki).

called modern type of piano that has a cast-iron frame on cross-stringing. On the other hand, its sound is much more like that of earlier type of pianos, which Liszt preferred during his carreer. Although Steinway already built pianos by Liszt's lifetime, in the current study the term 'Steinway pianos' is used to describe the modern instrument made from the beginning of the 1990-s. The difference between those two above-mentioned pianos can be found not only in the sound quality (timbre), but also in tuning. The Chickering grand has a lower tuning, which is typical for instruments built during this period. Tuning itself has no remarkable influence to the sound quality. This can be proven by tuning a modern piano a quarter of a tone lower. The change in the tuning level will not affect the sound quality of the instrument.

The modern piano has two or three pedal devices, each with their own function. When discussing the piano pedal, it is not difficult to understand that the term pedal is used most often for the damper pedal. There are several reasons for that. In addition to the *una corda*, the damper raising device is the only pedal that has existed throughout all of the piano's development. When compared to the *una corda,* the use of the damper pedal has won a more important role in piano playing. At the beginning of pedal indication practice, the word *pedal* in the score was intended for the use of the damper pedal. The pedal to be treated in the present study (damper pedal) has many different names and indications. In his book, Banowetz has given a long list of pedal names that are based either on the pedal's function or on some other details. The following English names for the pedal have been used: *damper pedal, right pedal, loud pedal, open pedal, sustaining pedal, amplifying pedal, forte pedal and legato pedal* (Banowetz 1985: 10-11). Most of those names do not correspond to the acoustical or other properties of pedal. The historical term *open pedal*, for example, sounds curious today; a more characteristic term might probably be *open strings*.

By calling the pedal names *loud pedal, forte pedal* and *amplifying pedal*, one can understand that the pedal's role would be to increase the volume of the piano's sound. Banowetz wrote about the term (loud) pedal:

> "The right pedal has two primary roles – to prolong and connect tones that cannot be held by the fingers alone, and colour them. --- In addition to being called the "sustaining" pedal or "damper" pedal, the right pedal is frequently terms the "loud" pedal or forte pedal, since a note or chord played with the

> dampers raised from surrounding strings will actually sound a bit louder than the same notes played with the dampers in place. But the term "loud" pedal is misleading and decidedly does not describe accurately the real role of the right pedal." (Banowetz 1985: 11-12)

From Banowetz's text, one can understand that the use of the pedal would make the sound louder. However, according to him, it is not recommended to call it the loud pedal, because the increase in volume is only one of the acoustical effects produced by depressing the pedal. We can agree with Banowetz that the primary role of the pedal is to let the pianist raise the finger on a key without breaking the sound produced by that key. Next, we should examine whether the use of the pedal has some influence on the sound loudness in the case of a single tone. At the same time, the pedal's increasing effect ton the loudness of a single tone is not a matter of course. (Chapter 5.3 will further deal with some matters of the pedal's influence on the loudness.)

The name *legato pedal* indicates only one function of the pedal. The term *sustaining pedal* could mislead the pianist; the similar name in Italian language (*sostenuto pedal)* has a different meaning and indicates another pedal device on the piano—the middle pedal. However, in the action of a *sustaining pedal (right pedal)* and *sostenuto pedal (middle pedal),* one can find some similar principles. The name *right pedal* indicates the pedal's location. It could mislead the player interpreting the works of 18th century composers (for instance Mozart) who did not have in their use the foot control damper mechanism (pedal), but rather the hand stops for the lifting of dampers. Thus, the most recommended pedal name is *damper pedal*. In this study only the properties of the damper pedal will be analysed, and if it is not specified, the term 'pedal' always indicates this kind of pedal device. This condition will avoid any further misunderstandings in the current text by the use of the word 'pedal'.

1.5 CONDITIONS OF THE RECORDING

In the present chapter I will discuss the situation and the conditions of recording. For the recording sessions, I did not have the possibility to use a special laboratory for acoustical experiments. It would not be an impossible

task to find such a laboratory, but to transport two such instruments would create a problem. Moreover, dissimilarities in the sound qualities of two pianos can be detected by auditory sensation in practically any room. Thus, the differences in the sound qualities should be reflected in computer analysis.

The sound examples of the historical piano have been recorded in the Liszt-Museum in Budapest. The room of the museum has been an apartment, which was Liszt's last home in Budapest. In this apartment are three grand pianos and some smaller different keyboard instruments that Liszt used in his last decade. The Chickering piano I used for the recording was placed in one of these rooms. The examples on a modern Steinway have been recorded in the concert hall of the Sibelius Academy in Helsinki. Understandably, this hall is many times larger than the room in the Liszt-Museum. The piano's sound in the recording is always affected by the acoustical properties of the room where the performance takes place. Thus, when analysing the pianos' sounds, which were recorded in different rooms, some problems may arise in the comparability of these recordings. The only way to equalise conditions in analysing would be to avoid the influence of the room's acoustics on the recorded sound as much as possible. Recording engineers affirm that there is neither one correct and ideal piano sound signal nor one way to place the microphones. But if one's intention is to avoid the room's acoustics when recording, the microphones would have to be arranged as similarly as possible on both occasions. The best solution for this is to put the microphone as close to the piano as possible. In this recording session the distance was c. 20-25 cm from the strings. The tape recorder (DAT) was switched to mono mode for equalising the recording conditions. In the case of mono mode, two single signals have to be compared later, instead of two pairs of sound signals. The comparison of two different sound signals is much more reliable than two pairs of sound signals in the graphical mode.

As mentioned in Chapter 1.2, the present study aims to find out whether the partially depressed pedal on the Steinway would produce a sound more similar to the sound of the Chickering than the full pedal. To control the degree of pedal to be depressed on the Steinway, a number of wooden plates have been placed under the pedal. In the case of the present instrument, while depressing the pedal to the end, the dampers on the strings will raise c. 6 millimetres. Accordingly, when using half-pedal, such wooden plates would have to be placed under the pedal so that the dampers would raise c. 3

millimetres, with the quarter pedal c. 1,5 millimetres and with the one-sixth-pedal c. 1 millimetre. It should be mentioned here that in practice the interaction between pedal and dampers may differ in different pianos. In this study the concern with the influence of the (partial) pedal to the piano sound is more important than determining the exact distance between the dampers and strings. When many tones are played one after another, the minimally raised dampers may have some effect on the loudness as well as on the quality of sound. When the strings' vibrating amplitude is rather large, dampers that are close to the strings may disturb free vibration.

The sound examples from Liszt's piano works played on the Chickering were recorded a couple of months before the recordings on the Steinway. I attempted to perform those short examples in the same tempi on both instruments. As is normal in the interpretation of a musical work, it is not possible to succeed completely in this. Listening to the recordings, one can find that on the Chickering more examples have been played faster than on the Steinway. There may have been many reasons for that. The recording situation in the Liszt-museum in Budapest was not comparable to a typical recording studio situation. It was not possible to close the whole museum for the recording session and all three main rooms remained open for the visitors. Although the museum was not crowded, it was necessary to avoid recording the sound of the steps of visitors to the tape. Another disturbance during the recording session was the heavy traffic on the street next to museum. These factors required using time as effectively as possible and may, in turn, be reflected in the tempos of recorded examples. On the other hand, it took three whole days to make these recordings and the examples I recorded in the museum last only about three minutes altogether. Thus, I suppose the limited time in the museum could not have influenced the tempi I chose too remarkably. In addition to complicated recording conditions in the Liszt-museum, the acoustical properties of this historical piano may also have influenced the tempi of these examples. Because the acoustical properties of pianos are not in direct connection with recording conditions, the pianos' properties and their influences on the tempo will be treated separately in later chapters.

2
HISTORICAL REVIEW

2.1 A BRIEF HISTORY OF PIANO

The idea for a struck keyboard instrument came from the artist Pantaleon Hebenstreit (1667–1750). He improved the dulcimer[1] and played it throughout Europe as a famous virtuoso, showing how strings beaten with soft hammers could sound both delicate and powerful. In 1709 the harpsichord maker Bartolomeo Cristofori in Florence published a diagram and description of a piano called *gravicembalo col piano e forte*. He had begun to work on the instrument as early as 1698 and by 1726 had built about twenty pianos. In 1716 the Parisian Marius presented a model of the piano to the Paris Academy; the next year the Saxon Gottlieb Schröter showed his instrument at the Dresden court. Schröter admitted that Hebenstreit had inspired his invention. In the following years pianos were made exclusively in Germany.[2]

From the last quarter of the eighteenth century it is possible to follow two main national trends in the piano's evolution: the German (also Austrian and Italian) and the English. The pianos made in Germany, Austria and Italy were developed more or less from the harpsichord. Sometimes only the

[1] The dulcimer (known in Hungary as *cimbalom*) is an instrument with stretched wires to be struck with two wooden hammers held in the player's hand.

[2] The pianist to give the world's first piano recital was the German musician Johann Christian Bach. This concert took place in London 1768. (Sachs 1940: 395)

mechanism was changed. In 1772 the makers in England[3] began to prepare and develop the modern keyboard. The new English grand became much heavier, and it had two modern pedals.

The next important innovation took place in 1821, when Parisian Sebastian Erard created the new hammer action – *double escapement*. This action allowed the player to repeat a note promptly. About the same time, in 1825, Alphaeus Babcock in Boston produced the first full cast-iron frame. He was also the inventor of cross-stringing and took out a patent for it in 1830. Cross-stringing or over-stringing induces better resonance, allowing all the strings to run nearer the middle of the soundboard. The closeness of the bass and the treble strings produces more intense harmonics when the right pedal is depressed.

Since the 1850s the principal construction of the piano has been the same, but the sound quality of the pianos of this time differ from today's instrument. The reason for the difference is mostly the size and material of the pianos and their details. The hammers, for instance, were covered with leather until 1830, but later felt came into use. The distance between the soundboard and the strings was also enlarged.

The material of the string has also been of interest to piano makers. In 1881 the manufacturer Bongardt in Röslau (Bavaria) found a new kind of high-strength steel wire, which was much stronger than the one used previously. The new material could sustain greater tension and allowed strings of greater diameter to be used. Thicker strings and a hammer with an appropriate mass will in effect produce a louder sound (Goebel: 1952, 14–22). The following table gives some physical data of strings made in different times and places. The first column of the table indicates the time and place the strings were produced. The second one indicates the number of different sizes (thicknesses) of strings produced by a certain maker at a certain time. The last two columns present the diameters of the finest and the thickest strings. As can be detected from table 2.1, the diameter of piano strings, especially in the treble, grew remarkably in thickness during Liszt's lifetime.

[3] The first English grand was built in 1772 by Americus Backers.

Place, year	Number of (string) sizes in production	Minimum ø	Maximum ø
Vienna 1833	17 (strings)	0.20 mm	1.27 mm
Röslau 1833	31 (strings)	0.20 mm	0.99 mm
Röslau 1881	29 (strings)	0.73 mm	1.60 mm

Table 2.1 The production of strings in 19th century in Europe.

An ideal string vibrates in a series of modes that are harmonics of a fundamental. It means that the fundamental and its harmonics are in exact numerical relation. Thicker strings made from the new material had more stiffness. The stiffness of the strings caused some changes in the amplitude and frequency of partials: the amplitude of higher partials decreases more than in the case of lower partials. Some of the overtones are not necessarily in whole-number proportion to the fundamental tone. (The first and the second partial's proportion, for instance, can be 1:2,05 instead of 1:2.) All of these things together influence the timbre of the piano. (The influence of the partials on the timbre is discussed in Chapter 4.)

2.2 THE DEVELOPMENT OF THE PEDAL

We cannot examine the development of the piano and its pedals separately. The piano as a complete instrument consists of many different details. All these details have been made and combined for a certain purpose: to produce as pleasant and diverse a sound as possible. Perhaps one goal of piano makers has been the imitation of the human voice on the piano. To achieve these ideals of sound, piano makers of all periods have attempted to improve the instrument. To claim that the sound of early pianos is somehow defective is not correct. Of course, early instruments are not as durable as modern pianos because of the materials used. Besides the durability of the instruments, piano makers have been taking many other requirements into consideration: the increasing size of concert halls, for instance. It is logical that one of the main purposes for developing the pedal device has been enriching the sound quality of the piano. When playing the piano works of earlier centuries and trying to achieve artistry in pedalling, it is important to know the facts concerning the construction and the action of the instruments and the pedal. These matters are not only of historical interest, but are

important in giving the pianist more possibilities to understand the composer's intentions regarding certain pedal effects.

The hand stop mechanism[4] of early pianos was taken directly from the harpsichord. Most pianos had one or two devices for modifying the sound: the *una corda* pedal and the hand stop for the raising the dampers from the strings. Three of Cristofori's pianos that have survived (1720, 1722, 1726) only have the *una corda* pedal. Using hand stops was too cumbersome. When the player needed to switch the *una corda* or the damper device on, he was required to lift his hand from the keyboard momentarily.

As with the development of the piano, in the pedal's evolution it is also possible to follow two main national trends: German and English. Instrument makers in Germany and Austria replaced hand stops with knee levers, which were used there until the end of the eighteenth century. The piano maker Anton Walter used a standard disposition of two knee levers, one for the dampers and one for the moderator. His rival, Johann Stein's instruments had two levers too, but they were only for lifting the dampers, for the bass and for the treble separately or together. On these instruments the damper rail was divided around middle *c* (c^1). In approximately 1810, when most German piano makers were making instruments with the pedal, the number of devices increased. Some of Graf's pianos, for instance, had six pedals: *una corda*, bassoon[5], two degrees of moderator[6], damper and the "Turkish music" pedal[7]. By the middle of the nineteenth century, piano design had become more standardised, and the number of pedals had been reduced to two: the damper pedal and the *una corda*.

In England the pianos were equipped with two pedals. The damper mechanism was introduced by Adam Beyer in London in 1777, but the patent for the pedal was only taken out in 1783 by John Broadwood. Usually the pianos made by English makers had pedals for the *una corda* and for

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[4] A hand-operated device for lifting the dampers.

[5] The depression of the pedal causes a piece of parchment to buzz against the bass strings, producing a janissary (military music) effect.

[6] A pedal that introduces a strip of cloth between the hammers and strings on a piano to produce a muted effect.

[7] The player would press a pedal that caused a bell to ring and/or a padded hammer to strike the soundboard in imitation of a bass drum.

lifting the dampers. The pedal for the dampers was divided in half, one side for the bass and one side for the treble. Some pianos, for instance those made by Broadwood after 1806, had three pedals: two damper pedals raised the dampers at will from either the bass or the treble. The performer surely could not use all three pedals at the same time. As a curiosity, at the end of eighteenth century the pedal on Backer's pianos was located on the front legs of the instrument, like the English harpsichords. This arrangement was uncomfortable and soon the pedal was placed in the centre of the piano. When French piano makers began to make grand pianos, they used both of the damper lifting mechanisms: knee levers and the pedal. S. Erard built his first grand in 1796, and he followed the English arrangement of the pedal. In the beginning of the nineteenth century the pianos in France, as well as in Germany, were normally made with four pedals, although the French anticipated the Germans by a few years. The number of pedals was also reduced to two in France earlier than in Germany or in Austria.

The location and the mechanism of the dampers themselves have changed during the piano's evolution, depending upon the makers. The damper mechanism itself took different forms during its growth. In the pianos made in the 1760s in London by Johann Christian Zumpe, the dampers consisted of wooden levers, which were hinged to the back of the case and placed above the strings. Each damper was covered with a piece of soft leather. A rod was fitted to the end of the key and connected to the dampers. When the key was depressed by this rod, it allowed the strings to vibrate. When Broadwood and Erard began to make grand pianos, they placed their instruments' dampers under the strings. By the end of the nineteenth century most piano makers mounted the dampers above the strings. (Rowland 1993: 14-25)

2.3 A BRIEF HISTORY OF PEDALLING

Although the first keyboards with the damper-raising mechanism were built by the first half of the 18th century, and the pianos equipped with the foot-controlled pedal mechanism soon afterwards in the 1780s, the systematic notation of the pedal only took place in the 19th century. The pedal (or hand stop) was unquestionably used by many players during the second half of the 18th century depending on the school and on the country they represented. Pedal markings first occurred in France in the 1790s, and then in England. It

took a little longer to reach the rest of Europe, notably Vienna. The earliest indication for damper-raising (*mit dem Knie*)[8] can be found in Louis Jadin's first sonata from a set of three sonatas dedicated to *Madame Victoire de France,* written in c. 1787 (Rowland 1993: 53).

Before about 1820, a great number of piano schoolbooks and tutors were published in Europe, but only three of them – J. P. Milchmeyer (*Die wahre Art das Pianoforte zu spielen*, Dresden, 1797), Louis Adam (*Méthode de piano Conservatoire*, Paris, 1804) and Daniel Steibelt (*Méthode de piano*, Paris and Leipzig, 1809) discussed stops, levers or pedals in any further detail. This fact reflects the complicated situation involving the use of the pedal at this time, as well as the purpose of different piano schools – to give the most important general technical advice about piano playing for amateurs. Beginners did not need any particular instructions for pedalling. Neither was the use of the pedal common among professional European pianists at the time. One of the reasons why pedal markings were more of an exception than normal practice in 18th century piano scores was rather commercial. Because the piano was not available to every musician and music lover, the works could be played on other keyboard instruments such as the harpsichord, clavichord, or organ as well. These instruments, though, lacked any pedal devices for damper raising.

The use of stops, levers and pedals caused a lot of scepticism among many musicians and journalists. J. A. Hiller, for instance, wrote in *Wöchentliche Nachrichten and Ammerkungen die Music betreffend* (Leipzig 1766-69):

> "The instrument named *fortepiano*, that has been made so far by Silbermann only ... seems to most charming to most *Liebhaber*, especially when it is used with damping." (Rowland 1993:32)

Unprofessional pedalling by amateur pianists and even by professionals may have caused some critical attitude toward the use of the pedal among other musicians. Simultaneously with the more frequent use of the pedal at the end of 18th century, a new *tremolando*

[8] With the knee.

style[9] of piano music became more popular. According to some critical musicians, such continuous *tremolo* along with plentiful pedalling had a questionable aesthetic value, especially when this effect was given the main role in the work. Czech composer V. J. Tomášek, for instance, remained unimpressed about D. Steibelt's musical style:

> "[Steibelt] did nothing other than repeat the *C* major *vibrando* theme a few times while running up and down the keys with his right hand, and the "improvisation" was over within a few minutes." (Rowland 1993: 36)

In Europe there were three main pedalling schools: English, French and Austrian. The pedalling traditions basically depend on the instruments that are used in certain countries. Pianos made in different countries differed in construction and sound properties. The use of the pedal was more progressive in London and Paris. Grands of an English variety had a good singing tone, which was also louder than that of Viennese instruments. The pedalling style of the London school at the change of the century was described by German pianist F. Kalkbrenner, when thirty years later he formulated its main principle in his *Méthode pour apprendre le pianoforte* (Paris 1830):

> "Dušek, J. Field and J. B. Cramer, the heads of that school which Clementi founded, use the loud pedal, while the harmony remains unchanged." (Rowland 1993: 38)

Naturally, in London there was no single rule for pedalling. K. Czerny has divided the London school of pianists into two groups. M. Clementi, representing of the first one, had a firm touch and tone, with clear and voluble execution. Pianists of the second group, such as J. B. Cramer and J. Dušek, had beautiful cantabile and fine legato accompanied with the use of the pedal. Clementi's as well as other pianists' skill in pedalling continued to

[9] Using a lot of *tremolos* with depressed pedal was the trend of this period, especially during improvisation.

develop during their careers. According to K. Czerny, Clementi did not use the pedal during his earlier years, but only in his later years.[10]
The French pedalling tradition cannot be dealt with as a separate entity, because it was exported to Paris in 1790 by German-born pianist Steibelt and was later reformed by Dušek. Milchmeyer reported on the use of different pedal variants in Paris:

> "Composers and teachers ignored them, and regarded them as unnecessary, until finally the great talent of Herr Steibelt developed all these mutations carefully, demonstrated the effect of each one and defined its function. "(Rowland 1993: 35)

Steibelt first presented the idea of pedalling in 1797 in the first edition of his Sonata op. 27 no. 1, which is based upon listening to the harmony:

> "Use the pedal that raise the dampers, but when you hear that harmony is too confused, release the pedal for the value of a quaver and retake it immediately."

Vienna was the most conservative music centre by the end of the 18th century and the Viennese pianos were mostly equipped with knee lever damper-raising devices. The most typical representative of the Viennese style was the famous pianist J. N. Hummel, whose playing was extremely clear. His use of the pedal was rather restrained. Beethoven's piano playing and his abundant use of the pedal differed greatly from that of Hummel. Beethoven's performing style was exceptionally powerful and expressive, and the elegant pianos of Vienna were too weak in construction for such playing.

In the 18th century, there was no solid system for damper raising indications in the score. This situation reflects the novelty of the pedalling device and the absence of standardized construction by different piano makers. Above

[10] The nearly forty years younger Czerny could not have heard the piano playing of the young Clementi. Thus, this claim may be based erroneously on Clementi's printed scores of his early works, which do not have any pedal remarks.

all, the markings depended on the national schools of individual composers. The most common indications were the written words such as *open Pedal*, *avec la pédale, senza sordini*. Steibelt invented his own pedal remarks system, which was not taken up by other composers. Dušek was one of the first keyboard players who used the abbreviation *Ped*. in the score. In Vienna the pedal was indicated with the term *senza sordini*. Beethoven was among the first composers in Vienna to include pedal markings in his printed works (Piano Concertos op. 15, 19).

Similarly to earlier periods, the pedalling trends of the 1830s can also be divided geographically. At this period, Austria and Germany were conservative in the use of the pedal, and finger-legato[11] was the basis of piano technique. K. Czerny, Cl. Schumann, and C. Moscheles were representative of this school at this period. In France the pedalling was at a highly developed level, as A. Marmontel noted in *L'Art classique et moderne du piano* (Paris, 1876):

> "Thalberg, famous master and model virtuoso, employed the pedals with a wonderful touch. Following his example, pianists of the France school are also distinguished by the use that they made of this method." (Rowland 1993: 123)

After the 1830's, a thoroughly modern and sophisticated pedalling technique was developed by three pianists – Chopin, Thalberg and Liszt. According to his contemporaries, Chopin was a great pianist, but his piano style was extremely refined and intimate. This technique was not appropriate for big concert halls; therefore, his performances took place almost exclusively in the *salons* of Paris. In the use of the pedal, Chopin had achieved the greatest mastery, and he was uncommonly strict regarding the misuse of it. Thalberg's pedalling technique was also extremely refined, allowing no harsh effects or confusion of sound. Liszt's role in the development of piano technique, including the use of pedal, cannot be overrated. His pedalling will be discussed further in later chapters.

[11] Finger-legato in this context could be understood as contrary to legato with the help of the pedal.

Soon after the middle of the nineteenth century, the English type of grand piano won the leading position in Europe as well as in America. National schools of piano playing, including pedalling, could no longer be separated as clearly as earlier.

It is likely that throughout the history of piano playing pedalling during performance has never completely corresponded with the pedal markings written into the score. Since there is no absolute way to indicate the correct pedalling in the score, the ultimate execution of pedalling is left to interpreters, regardless of the composers' original intentions. Some composers are more exact than others in their pedal markings. In practice, the pedal is used more often than its actual markings found in score(s). Karl Czerny, for instance, noted in his piano tutor on Beethoven's pedallings:

> "Beethoven, in particular, employed [pedal] in the performance of his pianoforte works much more frequently than we find it indicated in those compositions." (Czerny 1963: 22)

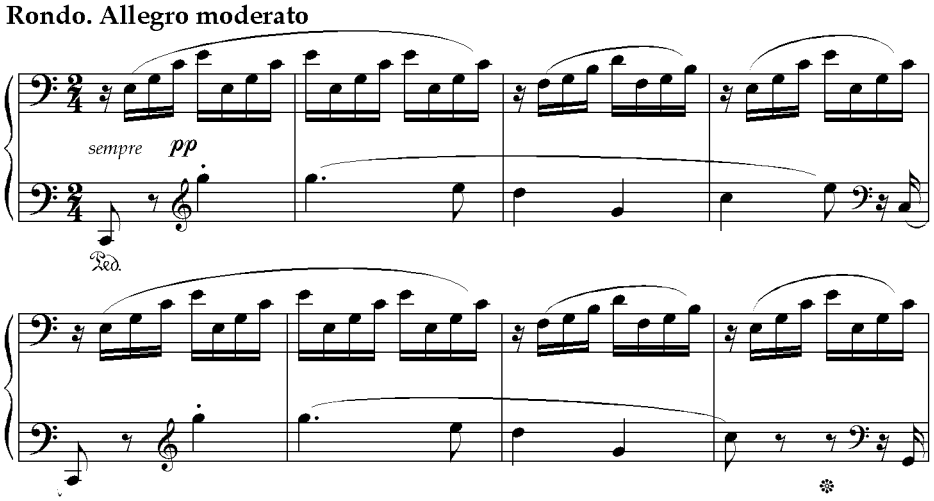
This remark of Czerny's is also valid in the case of most other pianists.

Although the pedal indicating practice differs from composer to composer, most of them still follow the same main principle of pedalling. If the use of the pedal is neither in conflict with fixed pedal markings in the score or with the character of the work, the pedal must be released at the latest with the change of harmony.[12] In other words, when the pedal is released simultaneously with a change of harmony or more frequently, the pedalling could be regarded as normal or traditional. The existence of this pedalling principle gives the composer the freedom not to include all pedal markings. When a composer wishes a different release of pedal than normal usage would presume, it is necessary to mark the change in the score.

In discussing such untraditional pedallings, we cannot continue without highlighting some further examples from Beethoven's piano music. As a rule, his pedalling is indicated only when a very specific or unusual piano sound effect is desired. An excellent example (Example 2.1) of such curious

[12] It has to be stressed, that in this study the statements about pedalling apply to the piano music of the 18th and 19th centuries, and to later tonal works.

pedal effects is the last movement of the Piano Sonata in C major op.53 ("Waldstein") by Beethoven.[13] In this example the unclear sound effect is a result of the right hand accompaniment figure that consists of two different harmonies (tonic and dominant).



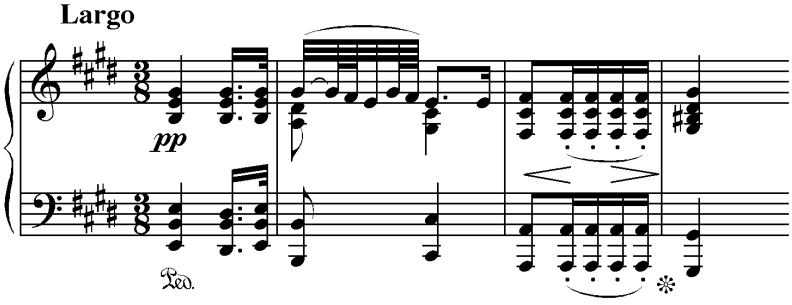
Example 2.1 The final movement of Sonata in C major op.53 ("Waldstein") by Beethoven with original pedal indications.

While in Beethoven's Sonata op. 53 the two harmonies are intended to be sustained with the same pedal, at the beginning of the second movement of his Third Piano concerto op. 37 (Example 2.2) the realisation of the pedal markings will cause an even more confused sound. According to the composer's score, the pedal should be sustained throughout several different harmonies.

According to Czerny, Beethoven himself strictly followed these indications in his own performance of this Piano Concerto:

[13] According to some musicians, Beethoven intended to use divided pedalling that allows a simultaneous differentiation in pedalling in both the treble and the bass. This point of view would be incorrect for two reasons. Beethoven wrote at the beginning of his sonata op. 53: "Nb. where ped. is written, all the dampers from the bass to the treble should be raised. O means that they be allowed to fall back again." (Rowland 1993: 47) Another reason, which excludes the use of divided pedal, is the location of the accompaniment figure in the right hand. It is found concurrently below and above this middle *c* (dividing point). Therefore, the realisation of either the bass or treble will not mute all tones in the accompaniment figure.

"Beethoven ... continued the pedal during the entire theme, which on the weak sounding pianofortes of that day did very well, especially when the shifting (*una corda*) pedal was also employed." (Czerny 1963: 109)



Example 2.2 Initial bars of the second movement of the Third Piano concerto op. 37 by Beethoven.

By the term 'pianoforte of that day' Czerny meant the Austrian type of piano, which Beethoven owned until 1803. Beethoven thus composed the Third Piano concerto in 1801 while still using an Austrian type of piano. In 1803 the French piano maker Sébastien Erard sent him a new piano as a present**.** Later, in 1817, the English piano maker Broadwood also sent Beethoven a grand piano made in his factory. From Czerny's comment it could be understood that on the English version of the piano the realisation of long original pedal markings are more problematic than on Austrian instruments. Observing Beethoven's pedal markings from different periods of his life, we can see that in his late period such problematic pedals became quite exceptional. Curious pedals occur mostly in works composed during the so-called "Erard-piano period" and earlier. One possible reason for this may be the more blurred sound on the English type of piano, when the pedal is sustained over several harmonies. One can suppose that another reason could be the deafness of the composer. Beethoven did not have enough auditory experience regarding the acoustical properties of his new instrument.

Before the time of Liszt such uncommonly long pedals can probably only be found in some of the piano sonatas and piano concertos by Beethoven. Although Beethoven's pedalling indications are older and are probably

discussed more than Liszt's, certain pedal markings of Liszt's are actually more problematic to realize on a modern piano. Beethoven's instruments sounded clearer and more gentle than those used by Liszt in his late years. In Beethoven's music the pedalling effect appears in order to mix two different harmonies, or in sustaining melodies played in a relatively high register. In some examples of Liszt's piano works presented in following chapters, one can find a situation where the pedal is marked to be depressed for a relatively long time, while chromatic melodies or passages are located in the low register.

2.4 LISZT'S PEDALLING ACCORDING TO HIS CONTEMPORARIES

In addition to Liszt's own pedal markings, the comments and documents about his pedalling written by Listz's contemporaries are also important sources for studying his pedalling. Although much has been written about Liszt as a phenomenon in piano music history, the number of documents dealing with his pedalling is not large. The comments about his pedalling come mostly from Liszt's pupils, his colleagues, the press and Liszt himself. Almost all of these comments consider the interpretation of the pedal, not the scored pedal indications. If the method of defining Liszt's practical use of the pedal were based exactly on his fixed pedal marks, it would not be difficult to understand the way Liszt used the pedal. In performance practice of piano music, all pianists use the pedal much more frequently than is indicated in scores. It is a common belief that Liszt's realisation of his own pedal indications did not correspond strictly to the pedal markings in his scores. Thus, studying those comments gives a wider perspective when considering the problems in pedalling in Liszt's works. Every writer's comments clearly reflect their respective personal attitudes to Liszt's interpretation, including the use of the pedal, and in some cases even their personal attitudes toward Liszt himself. Of course, Liszt himself as a person and as a performer could not entirely be separated from each other.

Every pianist has his own individual style, and the interpreter's personality and musical taste is also reflected in the use of the pedal. From the sources dealing with Liszt's pedalling, one can draw the conclusion that he always pedalled more heavily and boldly than was common at this time, especially when compared with the pedalling style of Thalberg and other famous pianists. Liszt's pedalling technique changed rapidly depending on the situation and the mood of music. His playing could be characterized by

crystal-like clearness, which never failed for a moment even in the most complicated passages. In the next moment Liszt could create blurred sounds with the pedal, or other unorthodox effects.

It has been mentioned above that some comments treating Liszt's pedalling are influenced by the writer's personal attitude to Liszt. Reading those reports one has to be careful in making decisions about the artistic level of Liszt's pedalling. We know of Clara Schumann's considerable antipathy towards Liszt as a person, and it is no wonder that the most critical notes about Liszt's interpretation come from her. Thus, Cl. Schumann's opinion reflects rivalry between two great musicians, as well as the differences between their aesthetic standpoints on music. She considered Liszt's playing style, as well his pedalling:

> "We have been hearing Liszt ... He cannot be compared to any other player – he stands alone. He arouses terror and amazement, and is a very attractive person. His appearance at the piano in indescribable – he is an original – he is absorbed by the piano. His passion knows no bounds, not infrequently he jars one's senses of beauty by tearing melodies to pieces, he used the pedal too much, thus making his works incomprehensible if not to the professionals at least to amateurs." (Rowland: 1993, 118)

Another critical review about Liszt's pedal technique comes from *Revue et Gazette Musicale* (April 9th 1837):

> "Liszt, who has already rid himself of numerous faults, still has one bad habit to lose, that of stamping with his foot when using the pedal, and marking the time by the same means." (Williams 1990: 88)

2.5 PEDALLING AS LISZT TAUGHT IT

Liszt was adored by his pupils. Many of them wrote reminiscences or kept a diary about their lessons. However, Liszt's students don't seem to have made many notes that focussed on his pedalling. Liszt did not use any systematic

teaching method, and his lessons were like improvised workshops. In those lessons one of his pupils normally performed some piano work, while a number of other pupils listened. Liszt would then make some critical comments about the performance or about the work. Usually he gave some general advice to the player; about the tempo, for instance. Sometimes Liszt himself performed the work played by the pupil or part of it. Very seldom did he concentrate on the solution to some technical problem.

From these sources one can see that Liszt also was not interested in the teaching of pedalling finesses. Arthur Friedheim, who studied with Liszt, wrote in his book *Life and Liszt* about a student complaining that Liszt had not taught him to use the pedals properly. (Rowland 1993: 124) More detailed facts about Liszt's teaching were reported by another pianist, August Göllerich, who was Liszt's pupil in the 1880's and kept a diary of the piano lessons. Throughout the many years he followed Liszt's teaching, Göllerich only noted a few comments made by Liszt about pedalling. These were also not comments on pedalling details, but the typical recommendation was just to use more pedal. When Antonie Bregenzer performed the Polonaise from Tchaikovsky's "Eugene Onegin" in 1885, for instance, Liszt recommended playing the introduction in a rather pithy way, arpeggiating the chords and using the pedal with a polonaise-rhythm. (Jerger 1975: 66)

According to Göllerich's diary, we can assume that Liszt's intention was that all his written untraditional pedal markings would be completely realised, both by his students as well as by himself. A couple of comments by Göllerich will prove this fact. In a lesson in May 1884, a student (Mrs. Großcurth) performed Liszt's *Après une lecture du Dante*. Regarding this event, Göllerich has written two short comments by the Master into his diary: "Enormous rise; Pedal!" The same example (3.3) has been presented in chapter 3.2, and it is clear that the realization of the original pedal marking is a big challenge for the pianist. In a lesson a couple of weeks later, Liszt demonstrated the beginning of his *2. Ballade*. According to Göllerich he played the passage in the left hand with great resonance and with a broad, rich sound and pedal, which can normally be heard rather brilliantly (Jerger 1975: 42-43).

2.6 LISZT AND SYNCOPATED PEDAL

In considering Liszt's use of pedal, one briefly has to mention the issue of syncopated pedal as a pedalling technique. The syncopated pedal or *legato* pedal is a pedalling technique in which two tones or chords are connected in the following way: 1) a tone or chord should be played with raised damper; 2) when the next tone or chord is depressed, the pedal should be immediately released; 3) when the previous tone or chord is absolutely damped, the pedal should be depressed again as soon as possible.[14] In fact, some of the principles of this pedalling technique can be traced back to the first half of the 19th century. In 1830 Kalkbrenner reported that the pedal may be successfully employed for a single chord, or for many chords in succession, provided it is relinquished each time the harmony changes; occasionally, a pedal taken after a note has been struck causes it to revive. Nevertheless, the use of syncopated pedal was not common in the 19th century. (Rowland 1993: 115)

Liszt's pupil Moriz Rosenthal reports in 1924 that in comparison with Liszt's days the syncopated pedal is the most distinctive difference in piano playing (Banowetz 1985: 206). According to Rosenthal, Liszt knew and used the technique of the syncopated pedal and Liszt had designated the term for the pedalling of long singing notes. In 1875 Liszt wrote to Louis Köler:

> "The entrance of the pedal after the striking of the chords is very much to be recommended, especially in slow tempi." (Banowetz 1985: 206)

During all of the piano's history, pianists and piano makers have been interested in achieving a singing piano sound, which is one important precondition for achieving good legato. From that viewpoint the 19th century was not an exception. It seems that the use of the syncopated pedal technique gives more ability to reach the best possible legato. Liszt, who probably was the greatest innovator of piano technique, succeeded in this, according to his contemporaries. A. Lavignac, who has heard Liszt's

[14] The word "syncopated" refers to the pedalling principle in which the pedal is not depressed immediately after a chord or tone has been played, but in syncopated rhythm, in other words on the weak part of the measure.

playing, has referred to this in his L'Ecole de la pédale (Paris 1889):

> "By spirited and violent effects clear-cut contrasts, he excelled more than anyone in reproducing the inflexion of human voice with his piano, and he obtained positively the illusion of swelled sound by taking the pedal after the note in long melodic phrases."

In summary, from the sources on the use of Liszt's pedalling, we cannot find any final and unique rules about the correct pedalling of his works. Liszt never had the intention of developing any particular area of pedalling technique nor a method for pedalling. This situation has best been summarized by Liszt's pupil Adelheid von Schorn:

> "His touch and his peculiar use of the pedal are two secrets of his playing…" (Williams 1990: 496)

3
PEDAL IN LISZT'S PIANO MUSIC

3.1 STYLISTIC DEVELOPMENT OF LISZT'S MUSIC

As mentioned before, the largest amount of long pedal effects by Liszt can be found in his late music. Stylistic differences between his early and late works are evident. Because the creation of such pedal effects forms part of Liszt's late style peculiarities, one has to treat briefly the stylistic development of Liszt's music.

It would be difficult to find a composer of the 17th and 18th centuries whose stylistic development would have been as considerable as Liszt's. Of course, a gradual artistic progress is self-evident in every composer's music. A rather exceptional phenomenon in Liszt's music can be detected: his musical style took a radical leap forward even after he had composed so-called masterpieces. In 1848, when Liszt finished his career as a pianist, a new period of his musical activity began. Since his Weimar-period (1848-61), orchestral music gained an important role because of Liszt's new post as a conductor. Nevertheless, these years were also rich in his fine piano works: B-minor Sonata, both concertos for piano, most of the Hungarian Rhapsodies, Deux Légendes, the final revision of Études d'exécution Transcendante etc. But while the form and dramatic development of this period's works reached a rather high level, the harmony of these works

seems to follow the more traditional principles characteristic to romantic music.

According to Liszt scholar James M. Baker, innovation in Liszt's works in the 1870-s and 1880-s can be detected in the harmony and in the form of his music. The tonal direction at times seems to be truly aimless and without bounds of any kind. Liszt was, if not the first atonalist, at very least the first major composer to embark on a course of such radical experimentation (Baker 1990: 145-146). The structure of harmony in Liszt's late music does not mean a complete loss of tonality, but rather an abundance of altered harmonies – diminished and augmented chords. In some works these alterations make the perception of the tonality impossible for the listener. For instance, in the piano piece Trübe Wolken (S.199), one can not find any major or minor triads, but through closer observation we can see that the basic key of the work is g minor. While he still used augmented and diminished chords and frequently used the whole-tone scale, he created new contrapuntal effects by playing themes and accompaniments against each other. In his late works anything resembling a cadence is avoided. If a work does end with a common chord it is more often in an inversion than in root position. (Searly 1980: 49)

The harmony is not the only innovative area in Liszt's late music. In this period's compositions the atmosphere of music started to play a more important role. His music of this period may contain impressionistic elements on occasion. The expression of melodies seems to be less intensive than in earlier works. In many late works of Liszt the melody consists of smaller motives, which are often repeated. Some characteristic examples of this kind of melody are *Wiegenlied* (Example 3.6) and *Trauergondel II* (Example 3.7).

The clear bravura endings characteristic to his earlier works are not typical in his late music. In piano works composed during his final years, Liszt's intention was not to demonstrate his own technical brilliance as a pianist, neither was creating effects important. Liszt had stopped his active career as a pianist and thus, he did not need to write attractive, virtuoso piano works. On other hand it would be incorrect to state that all his late works were technically simple. These difficulties are often so skillfully concealed that the audience cannot necessarily perceive them. Nevertheless, the proportion of virtuoso pieces obviously decreased during the last period.

From reading different biographies and studies about Liszt, one could come to the conclusion that Liszt's late music is not an unambiguous concept. Dividing Liszt's music into early and late works is in many cases problematic. More exactly, troubles can be detected in determining the dividing criteria. Liszt-researchers have divided his life into several periods. Humphry Searle, for instance in his book The Music of Liszt has divided the composer's life into four periods:

I. The Early Works (1822-39)
II. The Virtuoso Period (1839-47)
III. The Weimar Years (1848-61)
IV. The Final Years Part **I** Rome (1861-69)
Part **II** Rome, Weimar, Budapest (1869-86)

Another *Lisztian* – Alan Walker, has separated three periods of Liszt life:

I. The Virtuoso Years (1811-47)
II. The Weimar Years (1848-61)
III. The Final Years (1861-86)

According to Searle, Liszt's fourth period can be further subdivided into two parts. These two sub-periods can be differentiated based on the events in his life. During the years 1861-69 Liszt was closely connected with the (Roman) Catholic Church, but throughout the next period his activity was centered on teaching and on social life.

According to Searle's subdivision, Liszt's late works were composed during 1869-1886. Thus, all the works composed during that period belong to the category "late works". Such division, based on the chronological events of his life, is somehow problematic. The weakness of this division is that we also commonly use this term in the case of Liszt's works that consist of new kinds of harmony and structure. Thus, it does not necessarily reflect the stylistic development of Liszt's music. When observing the development of Liszt's works, it is very difficult to see clear boundaries between different periods. Not all the piano pieces composed after 1869 have the characteristics of his late music harmony and form. In studying Liszt's piano music, it can be detected that only in the works composed in 1880s do the majority meet the criteria for his late works. This raises the question: should the subdivision of his compositions be based on their chronological date or stylistic traits? One possible solution could be to separate the terms 'late music' and 'late style' of Liszt. Late music works would belong to this category on the basis of the date of their composition. Liszt's late style,

however, would denote his works that have the abovementioned novel form and harmony.

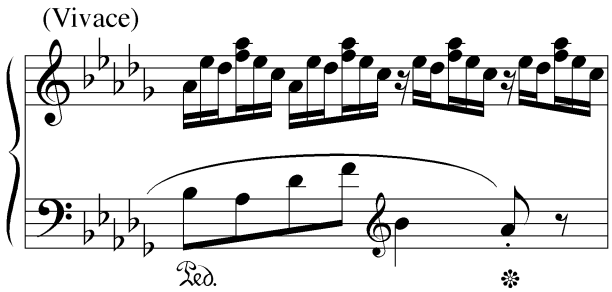
3.2 THE DEVELOPMENT OF PEDALLING IN LISZT'S PIANO MUSIC

When studying the pedalling of Liszt's piano music, two kinds of sources are available: written documents (memories) of his contemporaries and scored pedal markings by the composer himself. Some aspects of the stylistic evolution in Liszt's piano works were treated in the previous chapter. In observing both the changes in his pedalling, as well as the overall stylistic change in his compositions throughout his life, one can detect an identical evolution. As far as pedalling in Liszt's piano works goes, the most remarkable difference between the early and late periods is the number of pedal markings. While the pedal markings in his early works are only occasional, and even when marked, quite sketchy, then in his late piano works, excluding a couple of pieces, the pedals are scored systematically in every work. The number of curious pedallings and confused effects-producing pedallings also increased during his lifetime. It is possible that in earlier periods, Liszt did not intend to shock the audience as an innovative composer, but as a virtuoso pianist. The uncommon pedal effects would not have supported this purpose. It may be pointed out that a pianist, planning pedalling for Liszt's late works, would probably in most cases realize it in a similar way that Liszt himself would have done.

Performing the works of the young Liszt on the modern piano will usually not raise remarkable problems in the pedalling. Pedal remarks in the early works of Liszt are not exceptions, but the way of scoring them was quite occasional. In some pieces, such as in *Huite variations* (S.148) or in *Walzer* (S.208), no pedal remarks can be found. In the piano work *Apparitions* (S. 155), on the other hand, there are many pedal signs. Although most pedal markings from this period follow a pedalling characteristic to Romantic music, still in some early works some innovative pedal indications can be found that predict pedal effects typical to Liszt's late music.

In cases where the composer has fixed the duration of the pedal into the score, the situation is quite clear: the performers should follow the composer's indications. In many cases, when Liszt has fixed pedalling in the score, contemporary pianists would intuitively prefer a more frequent change

in pedallings than the composer intended. Most of these continuous, held pedals that span a whole melody are especially characteristic of the late music of Liszt. Melodies, which do not consist only of chord tones from the present harmony, and which are meant to be played under one pedal, can also be detected in some earlier works. Usually these kinds of pedallings of melodies are not as long and sustained in his earlier works as in the late works. In the Concert study *Waldesrauschen* (S.145), a situation can be observed where the melody in a lower register than the accompanying figure is held under one pedal throughout the measure (Example 3.1). In Chapter 1.1, modern musical aesthetics are discussed. It attributes higher value to the exactness and clarity of sound, including pedalling. I suppose that unlike the pianists of Liszt's day, most of the present-day pianists would release the pedal in Bar 5 of *Waldesrauschen* at the beginning of the second half of the bar, if the score does not provide any additional information about the composer's pedal indications.

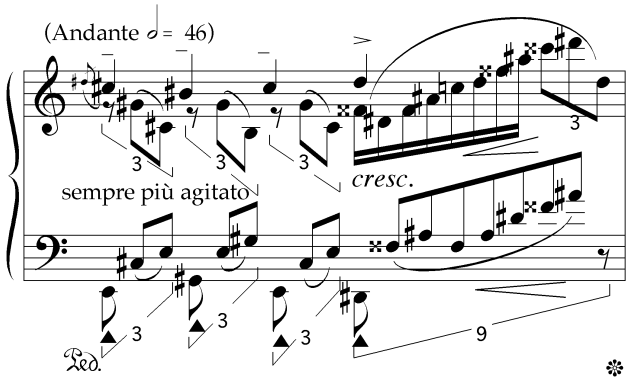


Example 3.1 Bar 5 from the Concert study *Waldesrauschen* by F. Liszt.

Although not all of the melody's tones belong to the D-flat major chord, no remarkable dissonance results. For modern piano, the lack of a linear melodic line seems to be more problematic, because the melody tones do not decrease/fade on the modern instrument as quickly as on the historical instrument. The simplest way to achieve better linearity in the melody in bar 5 of *Waldesrauschen* would be to make a small *crescendo* during the first half of this bar.

In *Apparitions* (1834) we can find pedal indications that produce a much more confused sound. In this example (3.2) several different harmonies follow each other in succession, while the pedal should remain depressed during all these harmonies. In studying the pedal indications of Liszt's piano

works, the principle of mixing several harmonies with the pedal is not typical. A long pedal over several diatonic or chromatic melody tones is much more common. In the Example 3.2 Liszt combines these two pedalling practices, sustaining the changing harmonies and blurring chromatic melody tones.



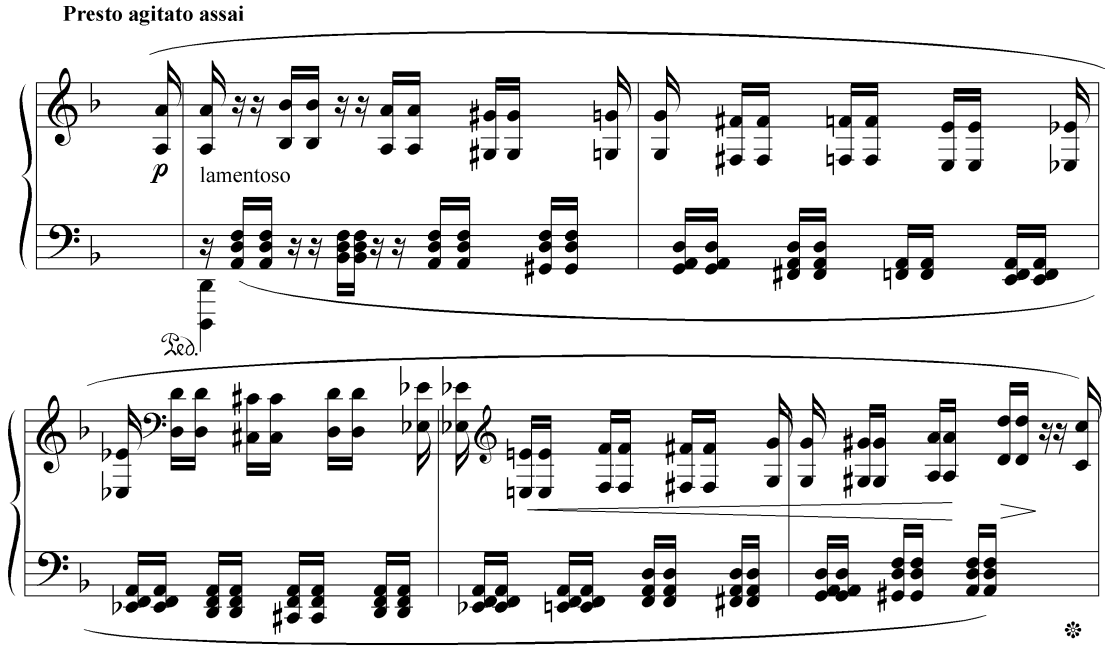
Example 3.2 Bar 51 from *Apparitions* by F. Liszt.

One famous example of an extremely long pedal is in the work *Après une lecture du Dante* (S.161).[1] The *Dante Sonata* is a well-known work and probably every pianist who has performed this piece has encountered these problematic pedal markings. It has been mentioned previously that the sustaining of different harmonies under one pedal is not a typical pedal effect for Liszt. At first glance, it seems that in this example Liszt, as opposed to his usual practice, mixed many different harmonies together with the depressed pedal. It seems that during the first four bars of this example, 20 changes in harmony under the same pedal can be detected, all of them placed in a rather low register. In further analysis of these four bars of the *Dante Sonata*, a curious phenomenon can be found.

When examining Example 3.3 more closely we can see that if we exclude the chromatic melody in the right hand (doubled also in the left hand), the

[1] The first version of so called *Dante Sonata* was written as early as 1839, the final around 1850. The original title of the piece in 1849 when it was given its final form was *Fantasia quasi Sonata* (*Prolegomènes zu Dantes Göttlicher Comödie*). The fact that the curious pedal effects which are typical to Liszt's late works appear also in some of the works of earlier periods demonstrates that the stylistic division of Liszt's music into early and late works by the date of composition is problematic.

only harmony that sounds during these five bars is *d* minor. While the *d*-minor chord sounds in the background, the curious blurred sound effect mentioned above is produced by this chromatic melody. In Example 3.3 we can detect that every chord in the left hand includes at least two chord tones of the *d* minor triad. At the same time the octaves in the right hand and the lower voice of the left hand chords form a chromatic melody, which consists of the chord notes and the passing-notes of the *d* minor harmony.



Example 3.3 Bars 35-39 from *Après une lecture du Dante* by F. Liszt.

When dealing with the pedalling in this part of the *Dante Sonata,* the most difficult task is achieving clarity in the texture, so that the audience can recognise the pitch of each tone. The intention of the composer has probably been to achieve an agitated and confused character in the music. At the same time the pianist must avoid the sum of indefinite sounds. The pedalling of the chromatic melody in a rather low register produces indistinct blurring, especially on the modern piano. In order to clarify the sounds in the this phrase, the performer has to minimise all the factors that produce blurring in the sound. A possible solution could be to play the duplicated melody in the left hand as softly as possible. The shape of this melody can be heard anyway in the right hand.

As has been mentioned above, the kind of pedal effects presented in Examples 3.2 and 3.3 are more characteristic for Liszt's late music than for earlier works. At the same time, some radical pedal effects can also be found in many late works, which are in stylistically rather traditional. In other words, the connection between the use of long pedal effects and the stylistic development of Liszt's music style is not evident.

3.3 SYSTEMATIZATION OF LISZT'S PEDAL EFFECTS

According to my calculations[2], there are almost 3000 pedal markings in Liszt's scores written between 1869 and 1886. To study and analyse each one of them individually would be a gigantic task and also is not the purpose of present study. To avoid this kind of unnecessary work I have systematized and grouped the pedal markings into different categories. Such categorization presents some problems. Sometimes determining the exact boundaries between categories is impossible and the categorization can be too artificial. In many cases the pedal markings may be so specific that it is difficult to put them into any certain category.

One can find a few principles for determining the categories. Two of them will be treated in the present study. The first principle is based on how the pedal functions on an instrument. According to my classification, realising a pedal marking is either feasible or not feasible on a certain piano. "Feasible" in this context means that although the tones played in the same pedal are blended we can hear and recognize each tone separately. With "not feasible" I mean a situation where the realization of a pedal marking by Liszt leads to the effect that the listener is unable to distinquish all the tones played. In this study, the functioning of the pedal on both historical and modern pianos is observed. According to this division the pedal effects fall into four categories:

I Pedal effects that can be realized on both kinds of piano
II Pedal effects that can be realized on a historical piano only
III Pedal effects that can be realized on a modern piano only
IV Pedal effects that can be realized on either piano

[2] See Appendix II.

The intention of this classification is to help determine such pedal markings by Liszt that require, in my opinion, reducing the indistinctness of sound when playing on a modern piano only. It should be mentioned that the boundaries between the categories are indefinite and depend on subjective factors. The pianist may sometimes have possibilities to influence the level of clarity to a certain degree by using temporal and dynamical means of interpretation. (I will analyse these aspects in more detail in Chapter 7.) We can also find many examples of pedal markings with which Liszt probably even desired to achieve the blending of the sounds. We can recognise such a situation by the accompanying texture, tremolos, some rapid passages, etc.

Category I includes pedal markings that function on both historical and modern pianos. In other words, realizing these pedal indications will result in an understandable and clear musical phrase on both pianos. The majority of Liszt's pedal indications in his late works follow traditional pedalling principles and belong to this category. These pedal markings are always "safe" to realise on both pianos, and there is no risk of producing any disturbing or blurred sound events. The piano piece *Wiegenlied* (Example 3.5), for instance, is a characteristic example of category I pedal markings. The realisation of the original pedal markings will not result in a blurred sound. At the same time I suppose that the majority of pianists today would most likely not use such a long pedal on a modern piano, if this kind of pedal indication were not written into the score. (Some aspects of this pedal effect will be treated in more detail in Chapter 3.4.)

Category II consists of pedal indications which function on historical instruments only. When played on Liszt's piano the realisation of some pedal markings may cause an effect that is quite close to sounding confused and indeterminate, but is still an understandable sound event. The acoustical properties of the modern piano differ from the historical one, and the result when realizing the same pedal indications may be a blurred sound. In this case we cannot recognise some of the sound properties (the pitch, the beginning of some tones). Even if we could determine the pitches, the result of the exact realisation of the original pedal markings might not satisfy us aesthetically. The pedal effect in Bars 10-13 of *Marche funèbre* (Example 3.7), for instance, is an excellent example of this kind of pedal markings.

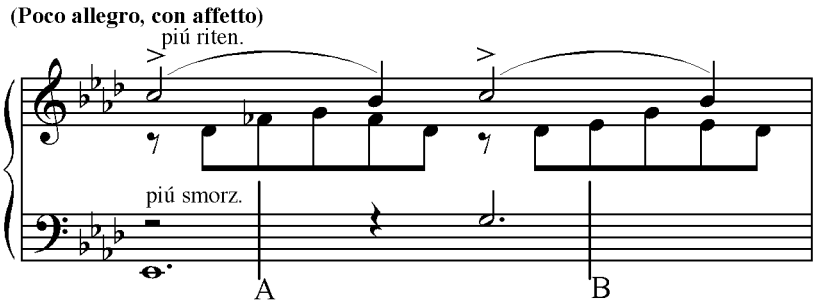
The pedal markings in categories III and IV can only be dealt with from a theoretical viewpoint. Category III includes pedal markings that function on a modern piano only. Category IV comprises pedal effects that function on

neither a historical instrument nor a modern one. The most radical pedal effects created by Liszt could be realised in many ways. As mentioned above, even if the pianist depressed the pedal exactly as it is written in the score, the variation of the dynamic and temporal parts of the interpretation may reduce the level of sound indistinctness. Thus, the same pedal marking could simultaneously belong to several categories, depending on the interpretation. Secondly, placing any work into categories III and IV requires passing critical judgement on the artistic level of Liszt's piano compositions, including his skill when composing pedal markings. Since Liszt gave scores of his works to publishers, it can be supposed, that he would have accepted the present versions of his scores, including pedal markings, and according to him the pedal should function at least on the historical instrument. Thus, anyone who determines that some pedal markings would not function on a piano from Liszt's time would put Liszt's skill to determine working pedal indications under suspicion, as well his ability to judge the artistic level of his work, including pedals. On the other hand, in the opinion of Searle, Liszt did not always enjoy the long and laborious process of sketching and polishing his works. He certainly lacked self-criticism on many occasions. (Searle 1966: 121)

Contemporary instruments have a louder and "rounder" sound than pianos of Liszt's period. Sustaining a long pedal over several different tones produces a more confused sound on the modern piano. If one could find a pedal marking that would not work on a historical instrument, the possibility that this pedal would function on a modern one would (generally) be excluded. This statement is based on the argument that on a historical piano the long pedal produces a clearer sound than on a modern one. Nevertheless, I have come across a pedal marking that, in my opinion, functions better on a modern piano than on an old one. This pedal marking can be found in Notturno No. 3 from the piano cycle "Liebesträume"[3]. This piano piece does not belong to the group of so-called late works; neither does it feature any pedal effects caused by the long pedal. As we can see from Example 3.4, there are no pedal markings there. Liszt has indicated four pedal markings at the beginning and thus presented the principles on how to use the pedal. According to the score, the pedal must be depressed at the beginning of each bar and released by the end of the bar. In Bar 6 he has written the words *sempre pedale*. Bar 75 (Example 3.4) is located in the repeated part (of ABA

[3] The composition came out in 1845 and was originally written for voice and piano, but Liszt soon made a piano transcription of this song.

form) of this piece and thus the pedalling principle in this bar should be similar to that of the beginning bar. There is also another reason for using a single pedal in this bar. Not many pianists are able to simultaneously hold two tones in the left hand with their fingers. Thus, the bass tone (E flat) in the left hand has to be sustained with the pedal until the end of this bar.



Example 3.4 The bar 75 of Notturno no.3 from Liszt's cycle *Liebesträume*.

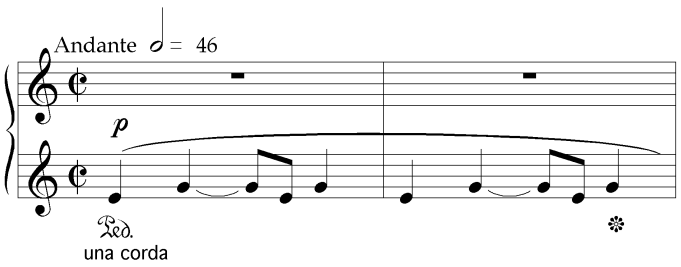
In Bar 75 we find two harmonies. The E flat ninth chord (the first half of the bar) changes to an E flat seventh chord (the second half of the bar). In other words, the tone F flat (indicated with the letter A) leads to E flat (indicated with the letter B). In my experience, when playing this example on a historical piano, the tones A and B sound with almost equal loudness. The simultaneous sounding of these tones causes a scratching dissonance and disturbs the perception of the change of harmony in this bar. On a modern piano, Tone B dominates after being played even when not depressed louder than the tone A. When Tone B covers Tone A, the listener is able to more clearly hear that Tone A leads to Tone B.

From the perspective of the present study, the second category is worthy of further consideration. Pedal indications belonging to this category have given the main impulse to this study where it concerns acoustical differences between pianos made during different time periods. Thus, most examples presented in the next chapter belong to this category.

3.4 EFFECTS CAUSED BY A LONG PEDAL

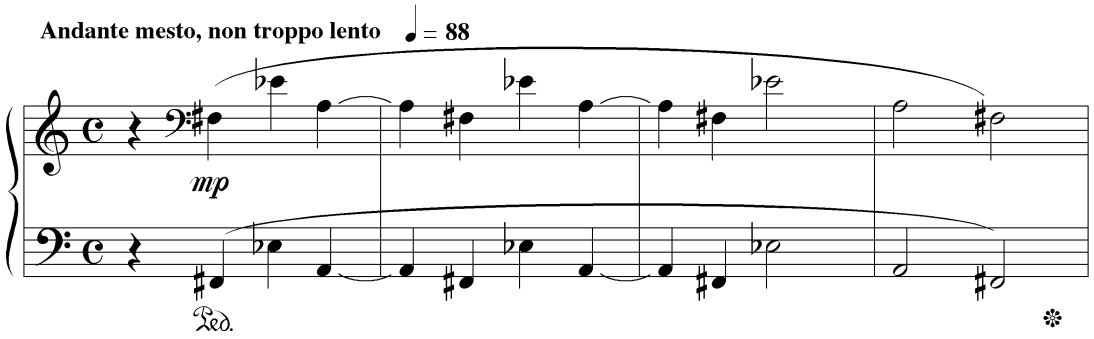
The second principle of the pedals' classification is based on the type of the acoustical effect produced by the pedal. In the case of this second systematisation, the pedal effects in the present study are divided into two main categories. The first group consists of effects caused by an unusually long sustained pedal. The second category, treated in the next chapter, includes effects caused by the abrupt release of the pedal.

As the present research has repeatedly mentioned, the sustaining of a long pedal over several tones or chords will produce an indistinct sound. Naturally, the degree of the sound confusion caused by unusual pedalling is dissimilar in the case of different examples, and it depends on several factors. In the case of a long pedal, one of the most important matters that influences the clarity of the sound is the intervallic relations between tones and the register in which the tones are placed. By relations between the tones I do not actually mean the vertical interval contents of the chord, but rather the intervals between the tones of the melody. When the melody is located in the middle or in the high register and repeated tones belong to chord tones, there will not be any problems recognising the tones of the phrase. One of most characteristic examples of this is the beginning of *Wiegenlied* (Example 3.5).



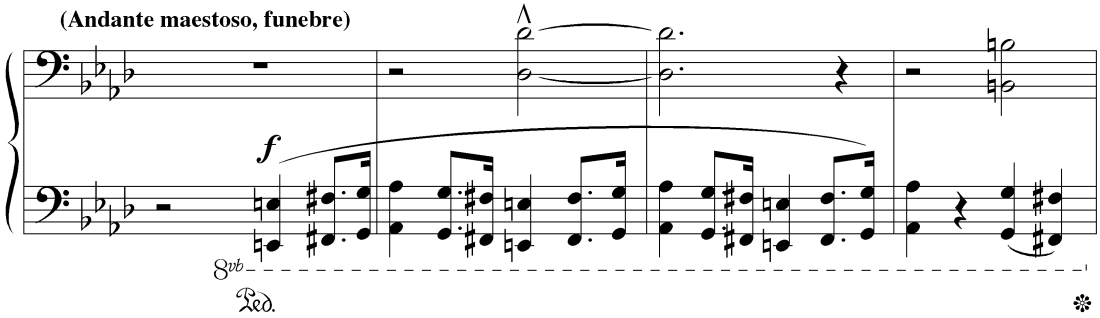
Example 3.5 The beginning of *Wiegenlied*

This pedal effect is quite easy realized and functions on both pianos. When the melody is in the low register, the recognition of the sounds will be slightly more difficult, but the pedal will not cause unclear murmurs, if the tones of the melody belong to chord tones. In the initial bars of *Trauegondel II* (1885) by F. Liszt (Example 3.6), tones of a diminished chord are repeated under pedal.



Example 3.6 The beginning of *Trauergondel* by F. Liszt.

The most problematic pedal effects are found in a situation where many chromatic melody tones in a low register should be played with a depressed pedal. Such use of pedal may produce quite an interesting sound field. The intention of the composer in those cases is not to present every note of the phrase, but rather to create a special atmosphere. The bars 10-13 in *Marche funèbre* (Example 3.7), for instance, are a good example of this effect.

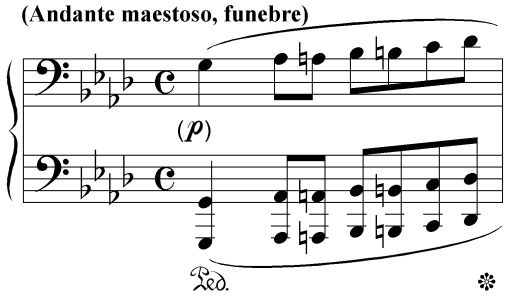


Example 3.7 The bars 10-13 from *Marche funèbre* by F. Liszt.

When playing this example on the historical piano, the effect of the pedal is quite impressive, and a mysterious funeral atmosphere is produced. On the modern piano this use of pedal does not function. This pedal marking of Liszt is probably one of the most problematic ones in his works. When the

pianist depresses the pedal fully, a loud, unclear and confused sound event can be heard. The performer has to find a musical character, which will help to realise this pedal effect.

An almost similar situation can be found in bar 28 of *Marche funèbre* (Example 3.8) although in this example the realisation of Liszt's pedal indication on the modern piano is not as problematic as in the previous one. The pedal should be sustained for only one bar, and when each note of this chromatic scale is played more loudly than the previous one the direction of the melody becomes clear.

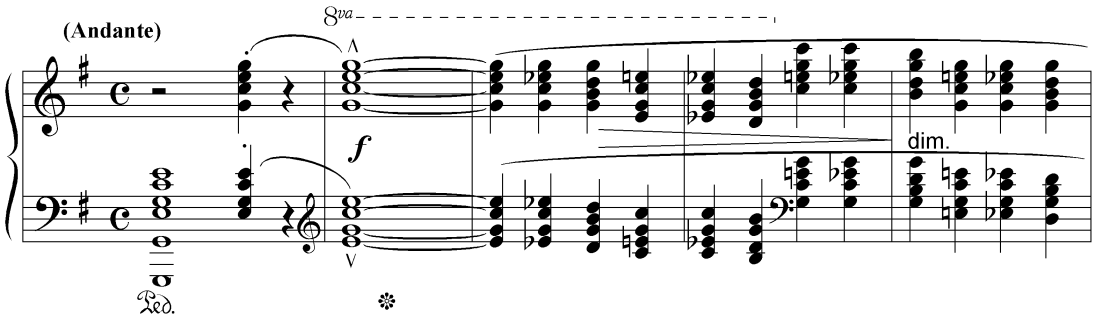


Example 3.8 Bar 28 from the *Marche funèbre* by F. Liszt.

3.5 EFFECTS CAUSED BY RELEASING THE PEDAL

The second group includes effects that are produced not by depressing or sustaining the pedal, but by the opposite, by releasing. The pedal effect caused by pedal release has been presented briefly in Chapter 1.2. As mentioned before, this kind of pedalling produces no problems for recognition of the tones. The complication is that the continuity of the phrase will be interrupted. In most such occasions the composer has not indicated *subito piano*. The degree of the contrast produced by the release of the pedal is different in different examples and it depends on many factors. The bass tones in the low register sound for longer and the level of volume will survive better than tones in a higher register. Thus, the dynamical contrast would be more considerable if the sound of a bass tone/tones was suddenly

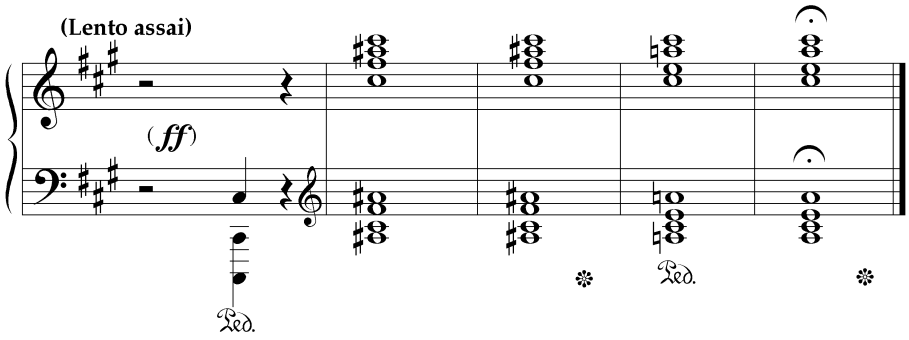
interrupted by releasing the pedal. In addition to the frequency of the (bass) tones the distance in time between the bass and pedal raise also plays an important role. Thus, in cases where the composer has marked a pedal release immediately after a bass tone, the contrast will be greater. From practical experience, it seems that when playing such effects on the modern instrument, the contrast is much more pronounced than on the historical instrument.



Example 3.9 Bars 201-205 from the *Aux cyprès de la Villa d'Este (I)*.

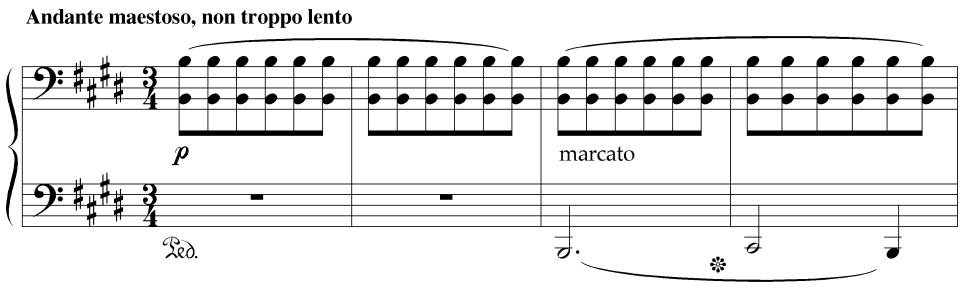
In Example 3.9 the final culmination of the piano work *Aux cyprès de la Villa d'Este, Threnodie I* (*Années de pèlerinage III*) is presented. In these bars the bass and the following large chords in the middle and in treble should be played under the same pedal. When the chord in bar 202 has sounded for a moment, the pedal should be released, so that the sound of the bass and chords played during the bar 201 will break. The chord played in the bar 202 will sound alone. The release of the pedal will suddenly decrease the loudness and the intensity of the sound. At the same time, it seems that the decrease in volume was probably not the composer's intention. This suggestion can be proved by studying the example in question. In the beginning of the bar 202 Liszt has indicated *forte*. Immediately after the pedal release no dynamic sign has been written. Still in the second half of bar 203 a *diminuendo* starts, which leads into *mezzoforte* placed in bar 210 (not presented in Example 3.9). It has to be added that according to my experience, the contrast between the loudness before and after the releasing of the pedal is considerably larger when played on the modern piano, as one would also expect.

While in the previous example the pianist can make the contrast softer by manipulating the tempo, dynamics and gradually releasing the pedal, then in the final bars of *Sunt lacrymae rerum* (*Années de pèlerinage III*) the possibilities for varying the contrast are much more limited. As we can see in Example 3.10, according to the score the pedal should be released approximately on the fourth quarter of the third bar from the end. Following this indication exactly would cause a remarkable decrease in the intensity of the music. One possible solution to avoid such an effect would be to sustain the pedal until the next chord, although it would be in conflict with the score. The contrast caused by interrupting the low bass (C#) will be produced anyway. The rapid depression of the pedal after the A major chord (second bar from the end) is recommended, because the vibrating sympathetic strings immediately after this chord will give the illusion of a continuous sustained pedal and a longer phrase.



Example 3.10 Final five bars (129-133) from the work *Sunt lacrumae rerum*.

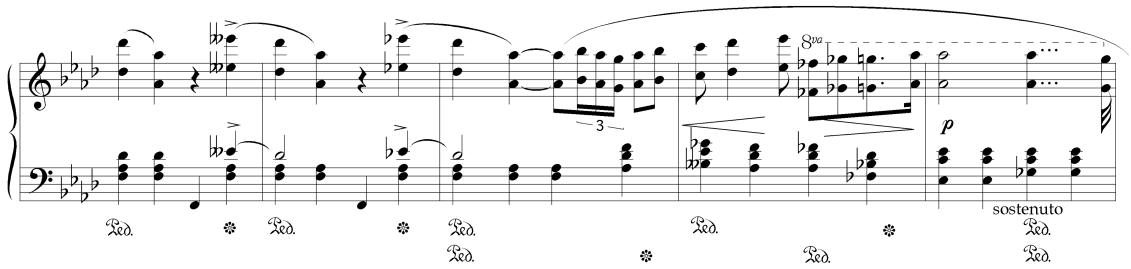
An excellent example (3.11) of a situation where the release of the pedal will cause not only dynamical contrast, but also some problems in articulation, is *Sursum corda*, the 7th movement from the third book of *Années de pèlerinage*. The difference in the articulation between the parts played with the pedal and those without pedal appear mostly in the right hand. If some of Liszt's pedal effects should be placed in a category, in which the pedal functions neither on a historical nor on a modern instrument, the pedal release marking in the end of bar 3 in *Sursum corda* might be one of them.



Example 3.11 The beginning (bars 1-4) of the *Sursum corda* by F. Liszt.

Liszt reworked many of his compositions. A number of early versions have survived, and the development of his musical taste can be observed. It would be logical to think that if a composer changes some details in his works, he carefully analyses or thinks about the result of such changes. Thus, the last version of a work should be better, at least in the composer's opinion.

The 5th movement *Sunt lacrymae rerum* from *Années de pèlerinage III* is an excellent work with which to compare pedal indications between its two existing versions. The pedal markings of these two versions differ from each other considerably in bar 27. Observing example 3.12, we find that in the earlier version Liszt sometimes scored pedal markings quite casually. In Bars 24-25, pedal markings are absent altogether. On the other hand, this does not mean that using the pedal is forbidden. According to the first version, the first half of bar 27 should be played without pedal. Such pedalling produces a kind of contrast in the sound that is manifested not in the dynamics, but in the dryness of the sound. It is also difficult to find an explanation for why Liszt intended to hold the pedal down from the second half of Bar 27 until the second half of Bar 28. This fragment, to be played under pedal, includes a modulation that leads from D flat major to A flat major, i.e. three consecutive harmonies. In the later version, Liszt has, in my opinion, corrected this instance of problematic pedalling by introducing this pedal marking a half bar earlier. The point of most harmonic activity occurs in bar 27. Liszt has pointed this out with *crescendo* and *diminuendo* markings. The *crescendo* can be performed much more successfully with the depressed pedal, in the way it is indicated in the final version.



Example 3.12 Bars 24-28 from the *Sunt lacrymae rerum* by F. Liszt. The lower pedal indications are from the first version and the higher from the second one.

4
AN INTRODUCTION TO THE PIANO'S ACOUSTICAL PROPERTIES

4.1 TIMBRE

Since the present study is concerned with the sound differences between Liszt-time and modern pianos, it must also deal with some matters relating to acoustics. The intention of this study is not to represent any profound guide about acoustics, but to declare very briefly some of the more important matters that will be used in this study. The difference between historical and modern pianos appears mostly in the timbre. Thus, the present chapter will deal mainly with aspects of timbre and especially with the piano's timbre.

Every musical sound consists of four components: pitch, loudness (dynamic), duration and timbre. Timbre (borrowed from French) or sound quality is defined by The American National Standards Institute (1960):

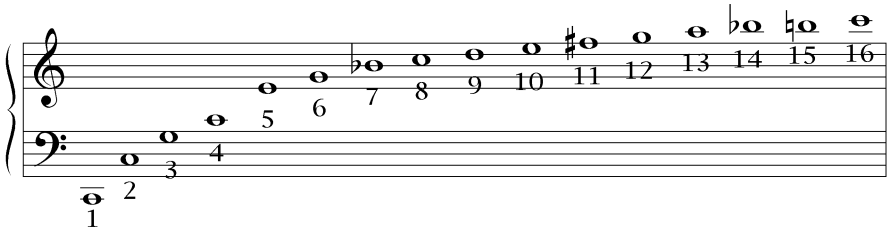
> "Timbre is that attribute of auditory sensation in terms of which a listener can judge two sounds similarly presented and having the same loudness and pitch as dissimilar."(Rossing 1989: 125)

This definition suggests that the judgment of timbre must take place under conditions of equal loudness and pitch (and probably equal duration as well).

To differentiate, for instance, the piano sound from the violin sound, it is not important to hear them playing the same pitch and the same loudness. So in 1976 R. L. Pratt and P. E. Doak suggested an alternative definition:

> "Timbre is that attribute of auditory sensation whereby a listener can judge that two sounds are dissimilar using any other criteria than pitch, loudness or duration." (Rossing 1989: 125)

Timbre depends primarily on the sound spectrum[1] and envelope[2]. All musical instruments produce composite sounds resulting from the simultaneous sounding of many pure sounds. The lowest of these is the fundamental. The fundamental C, for instance, has the sequence of overtones shown in Example 4.1. (Some of the overtones' frequencies do not correspond exactly to those of the tones in the equally tempered scale. Thus, in this example they are rounded off to the nearest chromatic tone.)



Example 4.1 Overtone scale

The numbers in Diagram 4.1 indicate the positions of the corresponding partial tones. Also, the intervallic proportions can be read directly from the diagram of the partial tone series. To take the numerical indications of the harmonic series as a starting point, we spot:

---

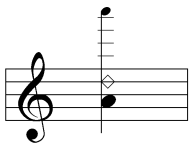
[1] The spectrum is the specification that indicates the amplitude of each partial tone of the complex tone. The determination of the harmonic components of a periodic waveform is called *spectrum analysis* or *Fourier analysis*, after the mathematician Joseph Fourier (1768–1830).

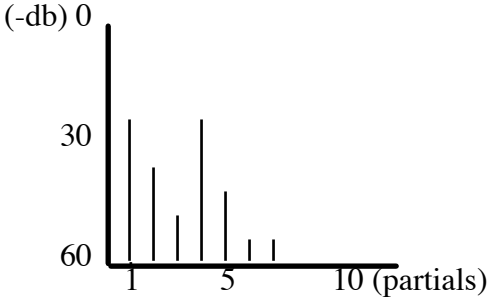
[2] The envelope is the vibration amplitude of tone as a function of time. More simply explained, the (graphic) envelope indicates the level of the amplitude (loudness) and its change during a period.

the octave at 2:1, 4:2, 6:3, 4:8 etc.;
the fifth at 3:2, 6:4, 9:6 etc.;
the fourth at 4:3, 8:6, 12:9 etc.; and so forth.

Diagram 4.1 Intervallic relation of overtones

Normally the fundamental is the one identified by the ear as the pitch of the musical tone. The overtones are usually not heard distinctly, if their intensity (amplitude) is much less than that of the fundamental. If any of the harmonics are stronger than the fundamental, in some cases the listener does not hear the fundamental tone necessarily, but the pitch of some partial, depending on the spectral constellation of the tone. For example, when the violinist is playing on the a-string, and the string is gently pressed at one-fourth the distance from the end (d^2), the fundamental tone is *a1* (440 Hz), but we hear the tone *a3* (1760 Hz), which is the fourth partial of the spectrum. The resulting tone is called a flageolet. The Diagram 4.2 presents the spectrum of this tone and Example 4.2 gives its musical notation.





Example 4.2 Violin overtone; **Diagram 4.2** Spectral diagram of this overtone.

Along with the spectrum, the envelope determines sound quality. Which of the two factors (spectra or envelope) has more influence on timbre depends

on the instrument.[3] The rapid changes in dynamics (in a few milliseconds), which are present in musical sounds, can cause important changes in their perceived timbre.

4.2 PIANO SOUND

Sound production in the piano is rather complicated. The strings are caused to vibrate by a hammer. The bridge communicates the vibration of the strings to the soundboard. Vibrational waves travel in many directions on the soundboard, whose most important action is to amplify the sound waves coming from the strings, and to make the sound of the instrument audible.

The position of the piano's cover also plays an important role in sound quality. If the cover is open, it reflects the sound in the direction of the audience. This effect is especially noticeable in higher frequencies, because lower tones always travel better and will come from well within the piano's case even when the cover is closed.

The size of concert halls has increased, and it has created a need to produce pianos with a louder sound. An ideal piano normally has a loud but singing sound. Experienced piano makers concern themselves with the ideal contact point between the string and the hammer. The sound quality, as well as the loudness, depends on the location of the contact point and on the mass and stiffness of the hammer. If the contact point is in the middle of the string, the sound will be quiet and "colourless", because the string produces mainly the fundamental tone. The first partial tone can also be heard, because the point in the middle of the string splits it in two halves, and both halves produce the overtone 1:2, which is the octave above the fundamental tone. By changing the contact point to a position that is closer to the beginning of the string,

[3] W. Strong and M. Clark performed some interesting experiments in which they interchanged spectra and time envelopes of wind instrument tones. They synthesized many tones, each time using the envelope characteristics of one instrument with the spectrum of another, and asked listeners to identify the instrument. They found that in the cases of some instruments (oboe, clarinet, bassoon, tuba and trumpet), the spectrum is more important than the envelope; in cases of other instruments (trombone and French horn), the spectrum and envelope appear to be of comparable importance; in the case of the flute, the envelope is more important than the spectrum. (Rossing 1989: 131,132)

more harmonics will be raised and the sound will be louder. If the contact point between the hammer and string is too close to the end of the string, the sound colour will be ”metallic”, and it will be impossible to play with a singing *legato*.[4]

4.3 SOME ASPECTS OF THE PIANO'S TIMBRE

When dealing with the piano's timbre, some aspects of the term 'timbre' have to be specified. The piano has its own characteristic timbre, independent of the maker and the period during which the instrument was made. It is true that experienced musicians can distinguish between pianos made during Liszt's time and that of the modern one, for instance. Some rare pianists may even be able to tell the difference by auditory sensation between the sound quality of a modern Steinway and Bösendorfer, for example. This is not an easy task, because even pianos made by the same maker during the same period can be dissimilar in timbre.

The mass and stiffness of the hammer are quite important for timbre. A heavier hammer is more inert; thus the time that the hammer and the string are in contact is longer than on a lighter hammer. The harder hammer will raise more partials, because its head is less elastic and the contact point is defined more exactly. It should be remembered that the performer can change neither the hammer's weight nor its stiffness, and the hammer always strikes the same point on the string. Thus the sound spectrum, which determines the timbre, does not change when the pianist tries to play the note whose timbre differs from the previous tone. He can only depress the key at a certain speed. The speed of the pianist's finger influences the velocity of the hammer, hence the loudness of the tone. After the hammer strikes the string, the pianist has no touch contact with the string, and no finger action can influence the overtone constellation. At the University of Pennsylvania an experiment was performed, in which single tones were first

[4] This effect can be also observed in violin playing: to draw the bow over the fingerboard (*sul tasto*) as close to the middle of the string as possible, produces a sound that is soft in dynamic and without brilliance; to move the bow as near as possible to the bridge (*sul ponticello*), to have in other words a louder sound, requires much bowing force, but the timbre is rather “metallic” and mysterious. On the violin the ideal distance of the bow from the bridge is approximately 1:7 of the total vibrating string.

played by a famous pianist and then duplicated by a cushioned weight falling on a key. No difference was detected. (Levarie, Levy 1980: 116) In other words, to believe that the pianist can vary the timbre of a single tone is not correct.

It is possible when the pianist plays on one instrument that the audience can perceive the same tone with a different timbre. In that case the pianist has probably played this tone with a different dynamic. The degree of loudness can somehow influence timbre by favouring higher overtones. Playing the same tone with different volume levels also changes the shape of envelope. Thus, the volume of the sound is in close relation to both determining components of timbre, spectra and envelope, and in practice it is very difficult to distinguish between the exact volume and timbre of the piano's tone.

As mentioned above, the pianist cannot practically influence the timbre of a single tone. The situation changes when more than one note is played. In a chord, a pianist can influence the loudness of each voice. When the volume of a tone in the chord changes, the complex vibration then has a new overtone constellation, hence the sound quality of the chord is also changed.

The timbre can also be influenced by the manner in which two or more tones, following each other, are bound. In legato playing, the first key is not to be released until the next key is pressed down. If the first tone is held over the beginning of the next one, the smooth change of timbre in the manner in which the dampers fall onto the strings can help to achieve better legato. Legato is therefore not only a result of the duration of the tones, but is also enhanced by factors of timbre.

4.4 THE ENVELOPE AND SPECTRUM OF PIANO TONES

As has previously been reported, the spectrum and the envelope are two factors that determine the timbre of the piano. Figure 4.1 shows the envelope of a piano tone. As we can detect from the figure, the most considerable event in the piano's tone occurs at the beginning of the envelope. With the

attack transient[5], the hammer gives the impulse to the string(s), after which the loudness decreases step by step.[6] Thus, it is the initial interval (of the envelope) that primarily determines the piano's sound. The piano's sound on the tape will not be recognizable when this initial interval (attack transient) is eliminated, or in the case that its location is not at the beginning of the sound.[7]

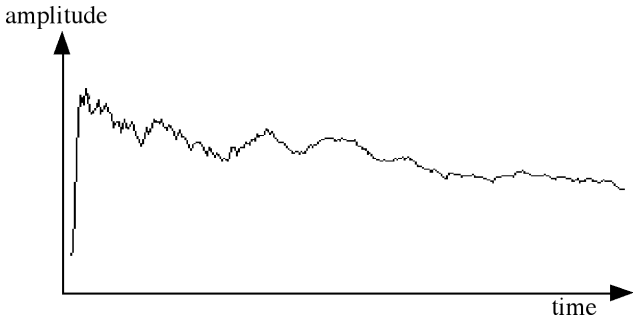


Figure 4.1 Envelope of the tone c^1 (262 Hz) during 1.000 ms (1 second) played on a modern Steinway.

[5] Attack transients consist of changes occurring before the sound reaches its steady-state intensity.

[6] To be precise, the loudness decays in two phases. During the first phase the amplitude's level decays, after a loud initial impulse, rather quickly to a certain level. In the second phase, the amplitude's decay will continue, but much more slowly. These two phases are easier to observe when higher frequencies are in question, as in Figure 5.4, for instance. In this case the first phase changed into the second one between 200 and 250 milliseconds after the attack transient, depending on the piano used.

[7] In 1987, A. J. M. Houtsma, T. D. Rossing and W. M. Wagenaars demonstrated an experiment. They played a tape recording of a piano backwards so that the attack transient occurs at the end. The sound is more suggestive of a reed organ than a piano. (Rossing 1989: 294) For a second experiment they recorded the sound of different musical instruments, then cut and spliced the tape so that the attack transient was removed. Without the attack transient, it is much more difficult to recognize the instruments on which the sounds are recorded. Some pairs of instruments, like trumpet and oboe, or French horn and saxophone, sound remarkably similar. (Rossing 1989: 130) I made an almost similar experiment with three recorded tones on a modern Steinway: *C2* (65Hz), c^1 (262 Hz) and c^3 (1047 Hz). In the case of each sound signal I removed the attack transient. The edited bass tone (*C2*) did not remind me of any classical music instrument. The most similar timbre might resemble a (toy) wind instrument. The middle register (c^1) of piano without the attack transient sounds like a saxophone, and the treble (c^3) one like a dulcimer (*cimbalom*).

The spectrum changes over the wide range of the piano. In the lower register there are naturally more partials in our hearing range than in the higher register. In the case of *C2* (65 Hz), for instance, as many as 30 partials can be detected; at c^3 (1047 Hz), less than 10 partials can be detected. (Rossing 1989: 294) In Section 4.1 (Example 4.2, Diagram 4.1) we have discussed that the level of the 1st overtone (fundamental tone) is not necessarily the strongest. We can also find this phenomenon in cases of piano tones in a low register (Diagram 4.3). In the case of a high register, in contrast, every next overtone is weaker than its predecessor.

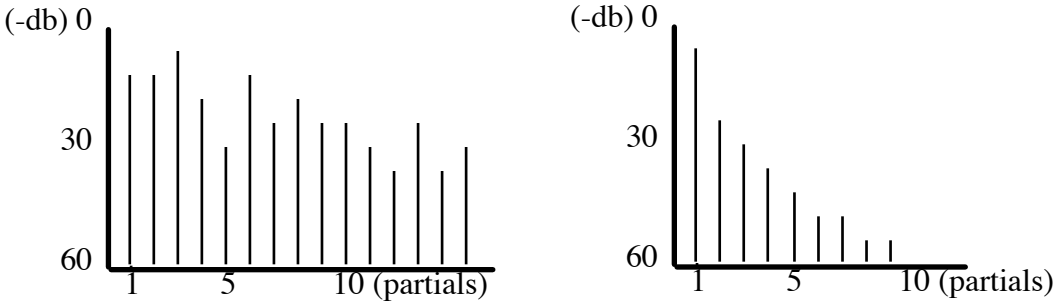
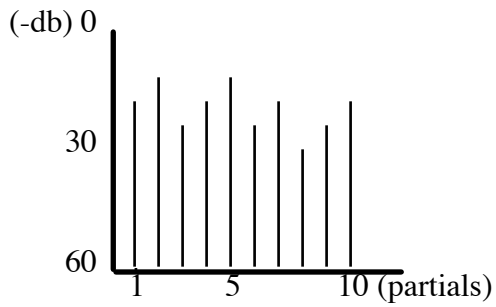


Diagram 4.3 a) Spectral diagram of *C2* (65 Hz) by 250 ms after attack transient.

b) Spectral diagram of c^3 (1047 Hz) by 250 ms after attack transient.

As we have seen in Figure 4.1, the amplitude of the vibration reaches the maximum level quite rapidly, in approximately ten milliseconds.[8] Afterwards the amplitude decreases. The higher and lower partials decay at different speeds, so the spectrum may change. Nevertheless, changes are quite accidental. In Diagram 4.4 the change in the spectral constellation of the piano over a short period of time is shown. (The spectra of a single tone played on the piano will be treated more exactly in Chapter 5.4.)

[8] This data is gauged by Steinway. The duration of the transient attack can be different with different piano makers. On a Chickering (1867), for instance, the maximum level of the amplitude builds up in 10–16 milliseconds



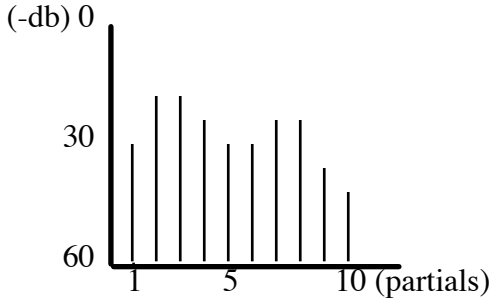


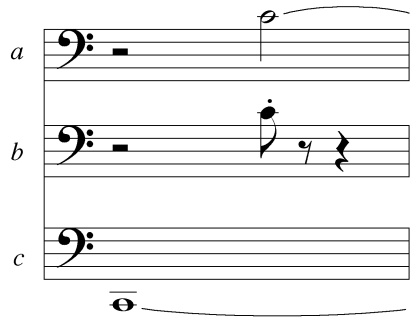
Diagram 4.4 a) The spectrum of the maximum level *C2* (65 Hz);

b) The spectrum after 500 milliseconds from the maximum point of the tone *C2* (65 Hz).

4.5 THE PEDAL'S INFLUENCE ON TIMBRE

The pedal has an important effect on the timbre of the piano. The use of the right pedal permits all the strings on the piano to vibrate freely. The principle of resonance will create sympathetic vibrations in many of the strings in response to the one that has actually been struck. The sum of all these vibrations influences the shape of the original vibration. The new constellation of the overtones can be heard as a new timbre. (Levarie, Levy 1980: 117)

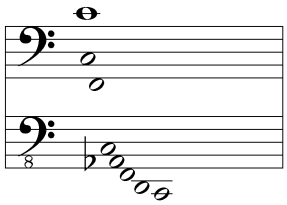
This can be proved with the following experiment (Example 4.3). Press the key *C2* (65 Hz) down slowly, not letting the hammer strike the string(s). Then play a short note c^1 (262 Hz), and immediately release the key. We can still hear the note c^1 after the damper has fallen on the string(s). The tone c^1 that we hear is the fourth overtone coming from the string(s) *C2*, not the string(s) c^1, because it is already dampened. The vibrational waves with the frequency 262 Hz (c^1) will be momentarily transferred from the string(s) c^1 to all other strings with dampers that have been raised and that have partials with that frequency. In this case the damper of the string *C2* (65 Hz) has been raised and its fourth partial (262 Hz) starts to vibrate.



Example 4.3 The upper staff (a) indicates the sound we hear,
The middle staff (b) the key to be played with sound
The lower staff (c) the key to be soundlessly depressed.

For instance, when we play a short tone *c#1* (277 Hz) after the key *C2* (65 Hz) has been pressed down silently, no sound can be heard after the damper has fallen down. The reason for this is that the tone *c#1* has no harmonic relation with the tone *C2*, i.e. *c#1* does not have the same frequency as any partial tone of *C2*.

In the next the experiment we silently depress the key *c1*, and then play a short *C2*. We can hear a similar effect: a sound with the frequency 262 Hz will resonate quietly. In this case the (4th) partial tone of the lower *C2* gives the impulse to strings tuned in 262 Hz (*c1*).



Example 4.4 Smaller note heads indicate piano's strings that have common partials with the same frequency than the string *c1* (the normal size note head).

To press down all the piano's keys soundlessly is the same as holding down the pedal. If we were to play a note again, for instance *c1*, the overtone constellation of this tone would be influenced by all the strings where the partial tone is *c1*. The tone *c1* is the second partial of string(s) *C3* (131 Hz),

the third partial of the tone *F2*-strings (87 Hz), the fourth partial of the *C2*-string(s); etc. (Tones, which partial is c^1 has been shown in Example 4.4.) In addition to that, strings that have similar frequencies with partials of tone *c1* will resonate. The second partial of c^1 is the tone c^2, the third g^2, the forth c^3, etc. Thus, the acoustical result of depressing the pedal is the sum of vibrations produced by a) an actual struck string, b) by strings that have common frequencies with the overtones of a struck string, and c) by strings whose overtones have the same frequencies as the struck string.

4.6 SUMMARY

In conclusion, the pianist's ability to influence the piano's sound is quite limited. The instrument has been tuned before the performance, and we press a certain key to sound a desired pitch. The loudness of a sound can only be partly determined. We could control the hammer's speed, which determines the tone's loudness at the beginning. After the string starts to vibrate, we cannot influence its amplitude, i.e. the loudness of the sounding tone. The pianist has more options for determining a sound's duration. Because we cannot influence the amplitude of the vibration, the sound fades out by degrees and the endless holding of a sound is not possible.

Furthermore the player cannot change the contact point between the string and the hammer during the performance; neither has he continual contact with the sound source, that is, with the string. One of the possibilities to influence the timbre of a single tone would be to press the pedal so that all the strings that share sympathetic overtones with this single tone can resonate freely. The second way to vary the timbre would be to play the tone more loudly. As mentioned in Section 4.3, louder playing slightly changes the spectral constellation and the envelope profile of the piano's tone, i.e. the timbre. We have also seen that a piano tone with a given pitch has its own spectrum and therefore its own specific sound quality. In the case of the piano's tone we can find the direct influence of the loudness and pitch on the timbre. But two tones with the same frequency and loudness have dissimilar timbres only when one of them is played with the pedal. On the other hand, differences between the sound qualities of a Liszt-time piano and a modern one can be detected even when the same key with the same speed is be pressed.

5
THE ANALYSIS OF A SINGLE TONE

5.1 ABOUT THE ANALYSIS

Chapter 4 explained that envelope and spectra are two components that determine the timbre of a tone. The same chapter also reported on an experiment presented by W. Strong and M. Clark. The purpose of this experiment was to find out which of these components (spectrum or envelope) is more important for the determination of sound quality of some wind instruments. Next, I will attempt to ascertain which of these components plays a more important role for determining timbre in cases of pianos made in different time periods. In this chapter, I will present and compare some envelopes of tones played on different pianos. In addition, this part will also discuss the influence of the pedal on the envelope of piano sound.

Most pianists with experience in playing and listening to historical pianos can recognise and differentiate by auditory sensation between the sound qualities of pianos made in the nineteenth and twentieth centuries. To determine which component of timbre causes the difference in sound quality between a Liszt-era and modern piano, one must analyse the spectra and time envelope of both pianos. For this analysis, the piano tones on both instruments were recorded on three different pitches: in the low register on tone *C2* (65 Hz), in the middle c^1 (262 Hz), and in the treble c^3 (1047 Hz). Every tone of the Chickering and the Steinway was played both with and without the pedal. My supposition was that in the realisation of some of

these pedal indications on a modern piano we have to use a partially depressed pedal to achieve a more similar pedal effect to the historical instrument. To examine the influence of a partially depressed pedal on the sound, I have recorded examples on the Steinway with 1/2 pedal, 1/4 pedal and 1/6 pedal. The envelope of each single tone presented in this part is observed during a period of 1.000 milliseconds (one second) from the beginning of the attack transient.

It is practically impossible for a human being to play and record numerous single tones on the piano with the same exact loudness. It was reported in the previous chapter that the spectra (but also the envelope) of tones played on the same piano with different volumes are not absolutely identical. On the other hand, we can separate the sound qualities of two pianos even when the tones are played with different dynamics. Thus, the timbre of the historical and modern pianos can be analysed independent of the loudness and it is not necessary to produce sounds with equal loudness by using some cushioned weight falling on a key.

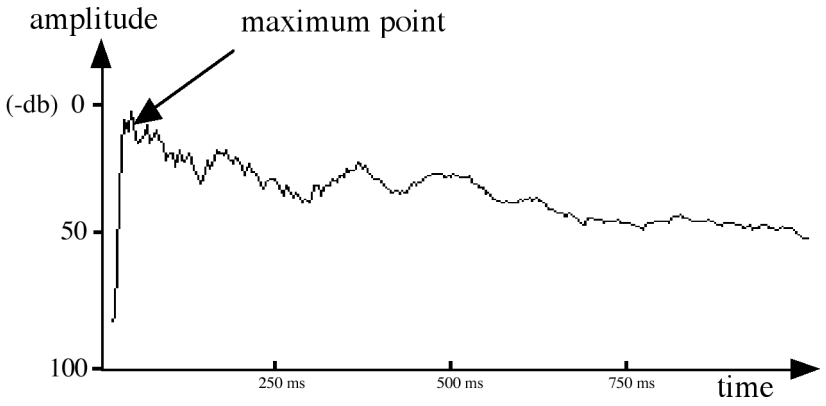


Figure 5.1 The envelope of a piano tone during 1.000 ms. The maximum point is located at the end of the attack transient (marked by an arrow).

In most figures in this chapter, two simultaneous yet different graphical envelopes are presented. Because the tones have not been played with equal level, the comparison of the two envelopes may be at least visually problematic. Therefore, I have determined the maximum point for each envelope of a single tone on the piano. In case of a piano tone, this point is

envelopes are presented in the same figure, I have directed one envelope onto the other, so that the maximum points of these envelopes have the same level.

5.2 THE ENVELOPE OF A SINGLE TONE IN DIFFERENT REGISTERS

Every pianist knows from practical experience that the lower tones of the piano sound for a longer time than the higher tones. We can also observe this phenomenon by comparing the graphical lines of the envelope of figures 5.2 (bass), 5.3 (middle) and 5.4 (treble). The characteristics of the low register envelope presented in Figure 5.2 indicate that the amplitude decays quite slowly after the attack transient. In the high register (Fig. 5.4), the amplitude decay is much faster.

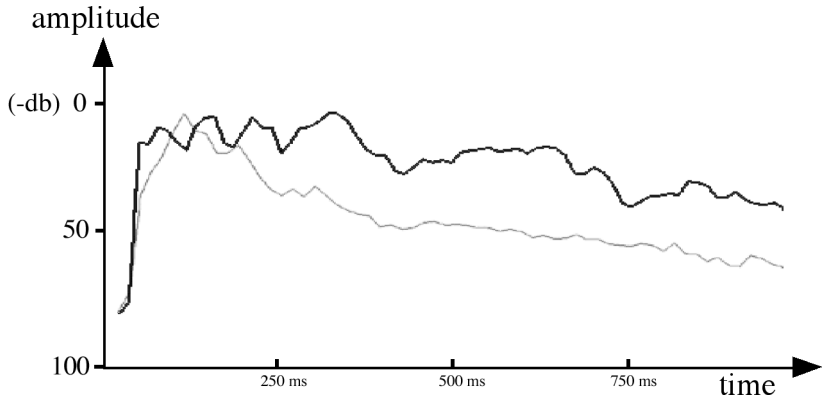


Figure 5.2 The envelopes of the tone *C2* (65 Hz) played on the Steinway (dark line) and on the Chickering (light line).

Next, we will study the differences between tones played without pedal on both pianos. One possible parameter for comparing all envelopes would be the time it takes for the amplitude to decay to a certain level. The amplitude decaying over 1.000 ms to the level -35 dB is presented for all registers and this can be applied to all the envelope figures in this chapter. Thus, for comparison, we can gauge the time from the attack transient of the signal until the point of envelope when the amplitude level decays to -35 dB. As we can detect from Figure 5.2, the first difference is that the Steinway has a faster attack than the Chickering. In the low register, the time from the

moment when the piano string starts to vibrate until its amplitude achieves the maximum level is considerably shorter on the Steinway than on the Chickering. 150 ms after the beginning of the attack transient, the amplitude levels of both pianos are almost identical. We can find further dissimilarities in the speed of amplitude decay. During the next 850 ms, the amplitude of the Chickering's tone decays remarkably faster than that of the Steinway. We can see from Figure 5.2 that the amplitude of the Chickering's tone in the bass register decays to the level -35 dB in approximately 300 milliseconds and in case of the Steinway's tone this time is 1.000 milliseconds.

The characteristics of the middle frequency (c^1 – 262 Hz) envelope follow the same pattern as the bass. The duration of the attack transient is much shorter on the Steinway than on the Chickering in case of the middle range as well, but the difference is smaller than in case of the bass. The amplitude of the Chickering decays rapidly during the first 300 ms. After this period, the level decays very slowly, almost maintaining a constant value at approximately -65 dB (Figure 5.3).[1] On the Steinway, the amplitude of tone c^1 (262 Hz) decays to the level -50 dB during the first 1.000 ms, while the same indicator for the low register is -35 dB. Figure 5.3 indicates that the difference between the envelopes of the Steinway and the Chickering is largest between 300 ms and 600 ms after the attack transient. The amplitude decays to the level -35 dB in the case of the Steinway's tone in the middle register in 650 ms, and by the Chickering's tone in 250 ms.

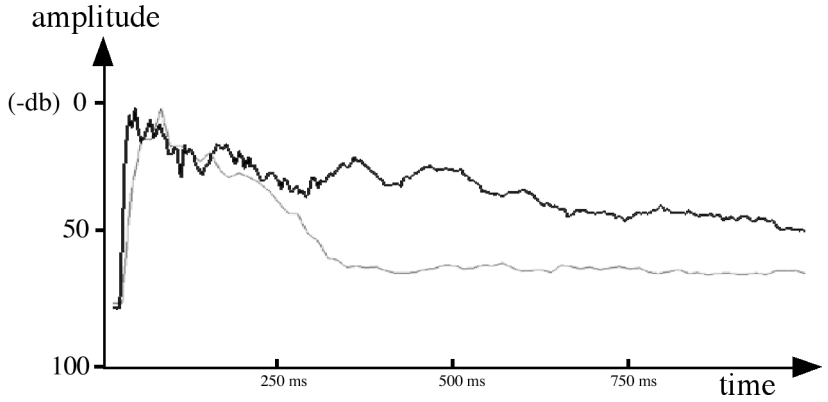


Figure 5.3 Envelopes of the tone c^1 (262 Hz) played on the Steinway (dark line) and on the Chickering (light line).

[1] The two phases of amplitude's decay were briefly mentioned in Chapter 4.4.

In the treble (Figure 5.4) the amplitude decays on both pianos considerably faster than in case of the middle register. Also, the differences between the amplitude decay rate of the Chickering's and the Steinway's tones are evident in the case of the high register. As we can see from the figure, the envelope of the Chickering decays to the level -35 dB in approximately 50 ms, whereas on the Steinway this endures at approximately 200 ms.

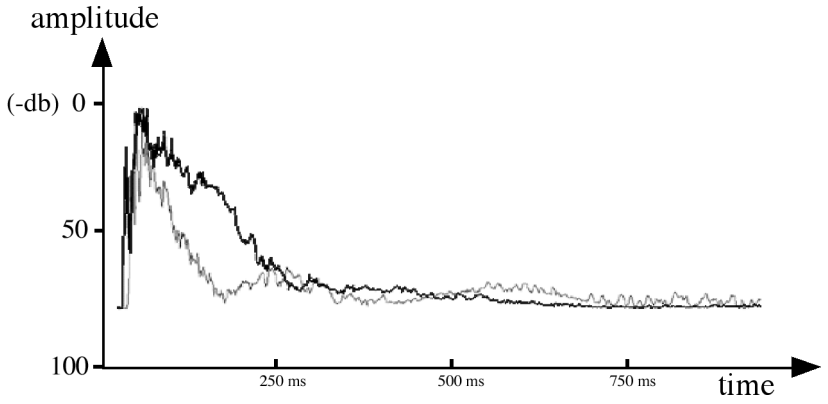


Figure 5.4 Envelopes of the tone c^3 (1047 Hz) played on the Steinway (dark line) and on the Chickering (light line).

Observing the envelopes on the Steinway, in the low register this level was reached at 1000 ms, in the middle at 650 ms, and in the treble at 200 ms after the attack transient. Thus, the speed of amplitude decay increases progressively in different registers. Based on the envelopes presented in this chapter, the amplitude decay of middle *c* (262 Hz) is 1.5 times faster than the amplitude decay of bass *C2* (65 Hz), but 3.3 times slower than the amplitude decay of treble c^3 (1047 Hz). On the Chickering, the increasing amplitude decay is even more progressive. While the decay of the amplitude to the level -35 dB took approximately 300 ms in the low register, the same level was reached in 250 ms in the middle and in 50 ms in the treble. In other words, the amplitude of the middle tone decays 1.2 times faster than that of the bass tone, and the treble tone decays 5 times faster than the middle tone.

Looking at the envelope decay rate on different pianos, the amplitude of the Chickering decays to the level -35 dB 3.3 times faster in the case of the bass, 2.6 times faster in the middle and 4 times faster in the treble, compared with

the Steinway tones. Although the objects of comparison were chosen randomly and the comparison levels in terms of percentages is probably not the most exact method, the difference of envelope between Liszt-time and modern pianos is still quite remarkable.

We know that the amplitude of higher tones decays faster. In addition, the level of the Chickering tone decays faster than the level of the Steinway tone with the same frequency. Based on this, we can determine a tone on the Steinway and a tone on the Chickering that have similar envelopes. In other words, these tones would have similar decay rate. These tones naturally have different pitches, but the sound qualities have similar properties when simply looking at the envelope. (The spectra of these tones is dissimilar.) Diagram 5.1 and 5.2 indicate how fast the envelope decays in case different tones played on different pianos.

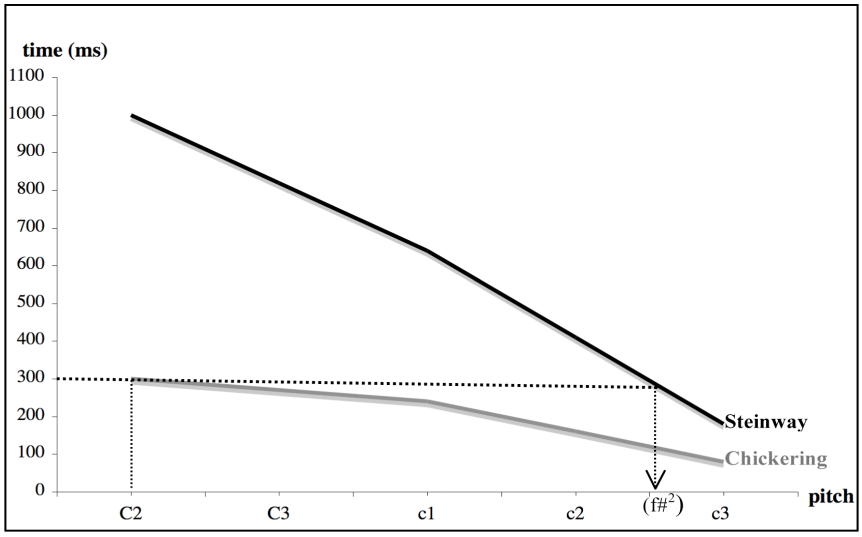


Diagram 5.1 The diagram indicates the duration (in milliseconds) in which the amplitude of tones with different frequencies played on two different pianos decays 35 dB from the maximum point. The horizontal axis indicates the sound frequencies and includes some specific tones (*C2*, *C3*, c^1, c^2 and c^3). The vertical axis indicates the period (in milliseconds), during which the amplitude of a tone with certain pitch played on certain piano decays to – 35 dB. The diagram indicates that the amplitude of the Chickering tone, for instance, decays to the reference level (- 35 dB) in 300 milliseconds. By connecting the Chickering's and the Steinway's amplitudes' decreasing lines with a horizontal dotted line, we can define which tones of the two pianos (having dissimilar pitch) have a similar decreasing speed. Another vertical dotted line with an arrow leads downwards to the pitch axis. The graphics of the diagram are not very exact, but the tone $f\#^2$ (740 Hz) of the Steinway seems to have a similar envelope to the Chickering tone *C2*.

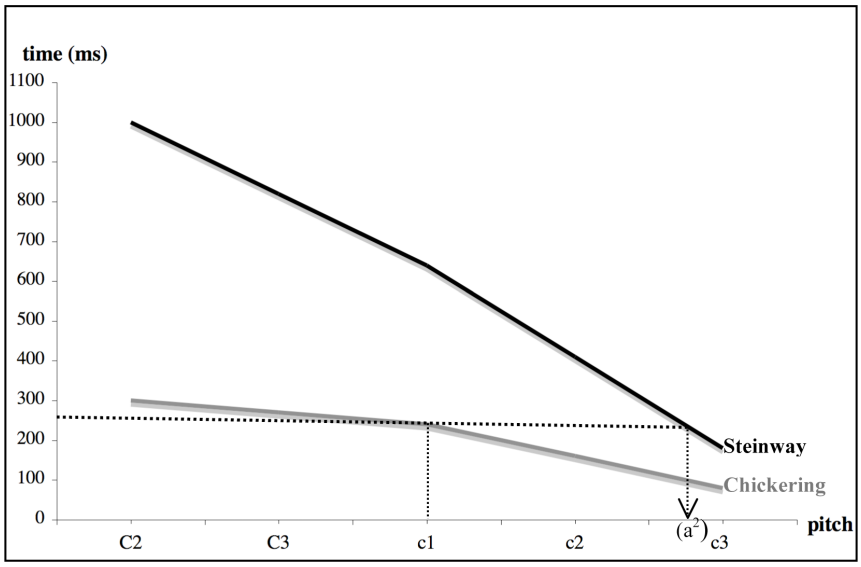


Diagram 5.2 We can repeat the same process with the tone c^1 (262 Hz) played on the Chickering. The corresponding Steinway tone with similar envelope characteristics would be a^2 (880 Hz).

Diagrams 5.1 and 5.2 indicate that on the Steinway the high register decays relatively faster than the bass register. Thus, the difference in the sound qualities of the pianos is less significant in the treble than in the bass. On the other hand, this difference between the pianos in different registers could be seen as a constant in terms of the unit of frequency (Hz). The decay rate of the Chickering tone is equal to the decay rate of the Steinway tone at an approximately 650 Hz higher frequency.

In theory, we could also apply this principle to some works by Liszt. For example, we could determine how much we should transpose on the Steinway in order to achieve an envelope with an almost similar shape. In Bar 28 of *Marche funèbre* (example 3.9), for instance, we should at first determine the so-called average pitch of this example. The passage covers three octaves, from *G2* (98 Hz) to $^{DB}3$ (139 Hz). Thus, the central tone of this passage is B^b2 (117 Hz). If we would like to emulate the sound clarity of the Chickering on the Steinway, the central tone of this passage should have the frequency 117+650=767 Hz and the nearest tone to that on the piano is g^2 (784 Hz). It means that *Marche funèbre* on the modern Steinway would be transposed two octaves and a major seventh higher than in the original composition. From my experience of playing this transposed example on the

Steinway, it seems that it would not be necessary to transpose as much as indicated by this simple calculation in order to achieve a clarity of sound similar to the Chickering. On the other hand, we know that this solution cannot be realised in practice, but it indicates the degree of difference between the sound qualities of the two instruments.

5.3 INFLUENCE OF THE PEDAL ON THE ENVELOPE

In Chapter 1.4, I discussed some terms used in this study, including the different names for the pedal. Among the terms mentioned were *loud pedal*, *forte pedal* and *amplifying pedal*. Next, we should examine whether the use of the pedal has some influence on the sound loudness in the case of a single tone.

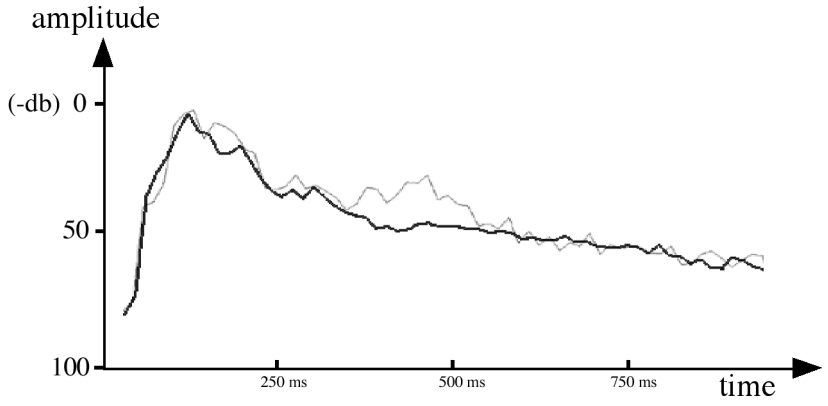


Figure 5.5 Envelopes of the tone *C2* (65 Hz) played on the Chickering with pedal (grey line) and without pedal (dark line).

When studying two envelopes of tones in the low register presented in the same figure, one played with the pedal and the other without, the difference in the average loudness of those tones is not remarkable but can be detected. The influence of the pedal in different registers and on different pianos can be very variable. In particular, the envelopes of the Chickering played with the pedal reveal an increase in amplitude at 400-500 ms (Figure 5.5).[2] Nevertheless, we cannot conclude on the basis of the figures in the present

[2] In trying to listen to these waves in the tone I practically could not distinguish them.

chapter that the use of the pedal in general increases the average amplitude level of a tone.

When playing the Chickering in the low register without pedal (the dark line in Figure 5.5), the amplitude decays quite evenly. The envelope of the tone played with the pedal includes - besides generally falling - a local change (increase) of loudness at about 400 ms after the attack transient. Except for this last mentioned short period, the pedal has no remarkable effect on the loudness.

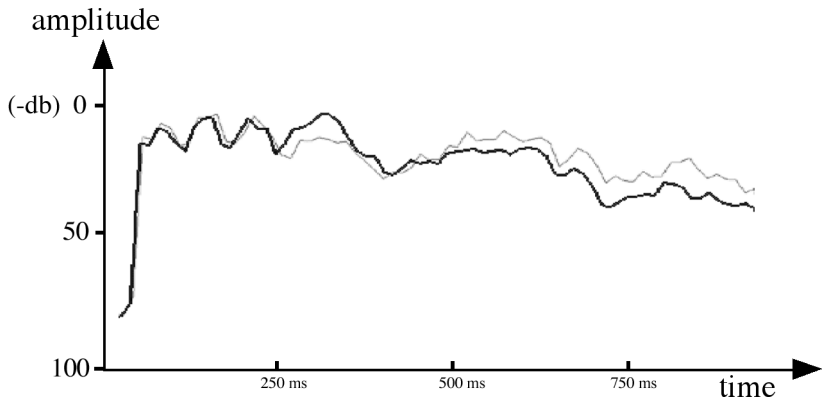


Figure 5.6 Envelopes of the tone *C2* (65 Hz) played on the Steinway with pedal (grey line) and without pedal (dark line).

The increase in amplitude that happened on the Chickering when using the pedal in the bass register was not found when using the Steinway (Figure 5.6). The use of the pedal on the Steinway slightly decreased the average level during the first 500 ms after the attack transient and increased it after 500 ms, when compared to the tone played without the pedal.

Observing the influence of the pedal on the Chickering middle tone envelope (Figure 5.7), we can detect the same effect as in the low register: the pedal produces waves in the envelope, but they are more irregular than in the bass. The amplitude decay seems to be somewhat faster when the pedal is depressed.

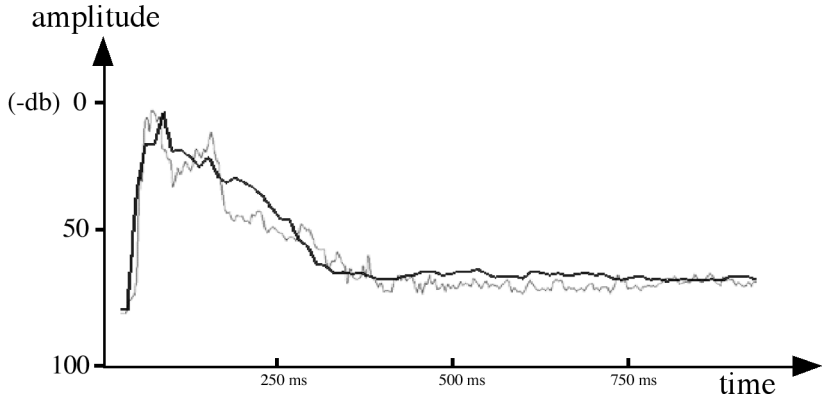


Figure 5.7 Envelopes of the tone c^1 (262 Hz) played on the Chickering with pedal (grey line) and without pedal (black line).

For the middle tone of the Steinway (Figure 5.8), the use of the pedal has a similar effect as on the Chickering. During the first 500 ms, the loudness is slightly amplified by the pedal, but the pedal seems to reduce the level during the latter half of the second. The difference is not large, but can be clearly detected. Thus, in the middle tone on both pianos, the influence of the pedal on the envelope depends on the fragment observed.

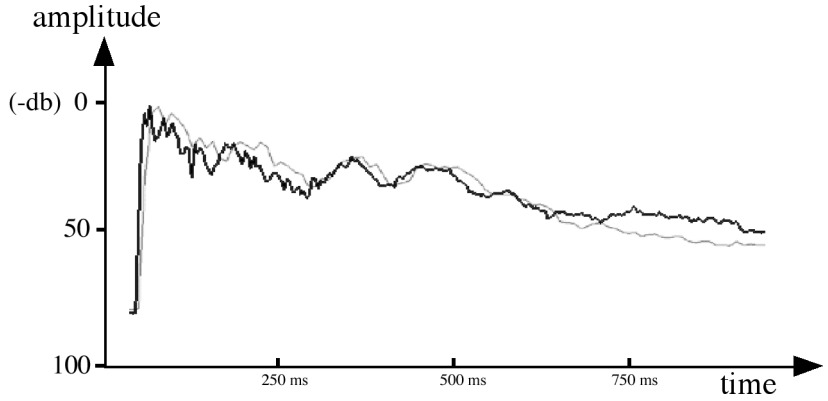


Figure 5.8 Envelopes of the tone c^1 (262 Hz) played on the Steinway with pedal (light line) and without pedal (dark line).

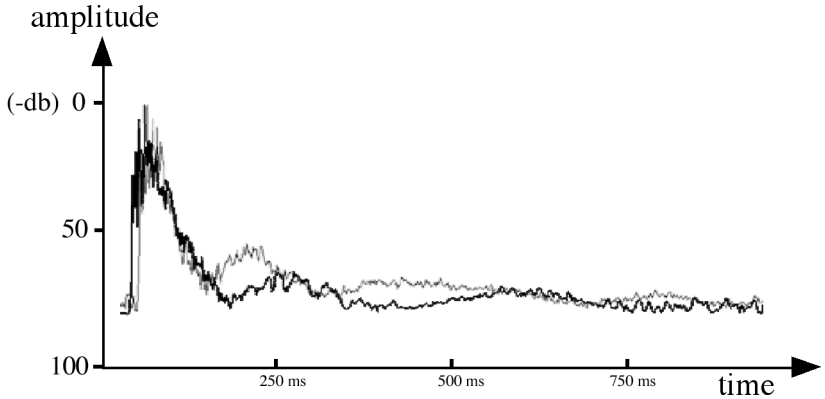


Figure 5.9 Envelopes of the tone c^3 (1047 Hz) played on the Chickering with pedal (light line) and without pedal (dark line).

According to the graphic envelopes presented in Figures 5.9 and 5.10, the use of the pedal in the treble contributes to the loudness dissimilarly on the different pianos. The envelope of the Chickering indicates that the use of the pedal slightly amplifies the loudness. However, on the modern Steinway, unlike on the historical piano, pedalling in the treble results in a faster decay of amplitude (Figure 5.10). The first larger decay in the amplitude lasts for a shorter time when the pedal is depressed, but afterwards the tone played without the pedal and the tone played with the pedal have almost equal average loudness.

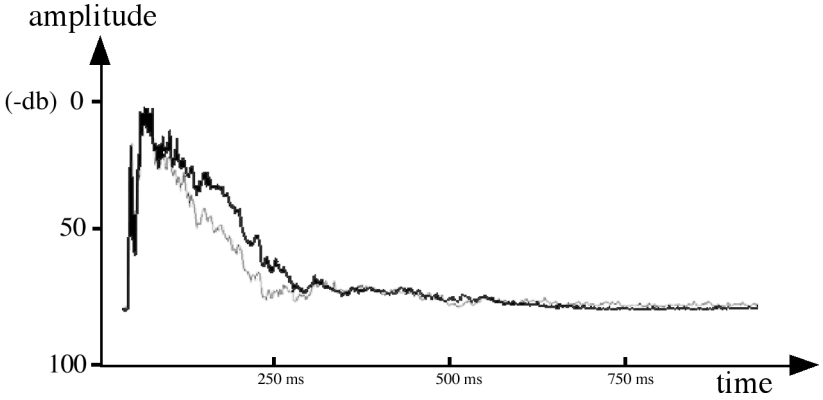


Figure 5.10 Envelopes of the tone c^3 (1047 Hz) played on the Steinway with pedal (grey line) and without pedal (dark line).

Having observed the envelopes presented in this section, I cannot conclude that the effect of pedalling on the loudness in different registers and pianos

reveals an evident regularity. We could thus proceed with a more exact analysis of the influence of the pedal on the loudness by looking at side-by-side envelopes of a tone played with different degrees of the pedal. Figure 5.11 shows the envelopes of the middle *c* played on the Steinway with full pedal, 1/2 pedal, 1/4 pedal and 1/6 pedal. This figure indicates that the use of full pedal and 1/2 pedal (the two darkest lines) seems to produce almost identical envelopes. The envelope of this tone played with 1/6 pedal (the lightest line) differs most considerably from the other envelopes in Figure 5.11. We can also see that during the periods 250-500 ms and 750-1000 ms after the attack transient, the tone c^1 played with slightly depressed pedal seems to sound relatively louder than with a more heavily depressed pedal. The loudness does not seem to depend on the degree of the pedal in other periods (0-250 ms and 500-750 ms after the attack transient). We saw almost the same effect when analysing the envelopes of middle *c* played with the (full) pedal and without the pedal (Figure 5.8).

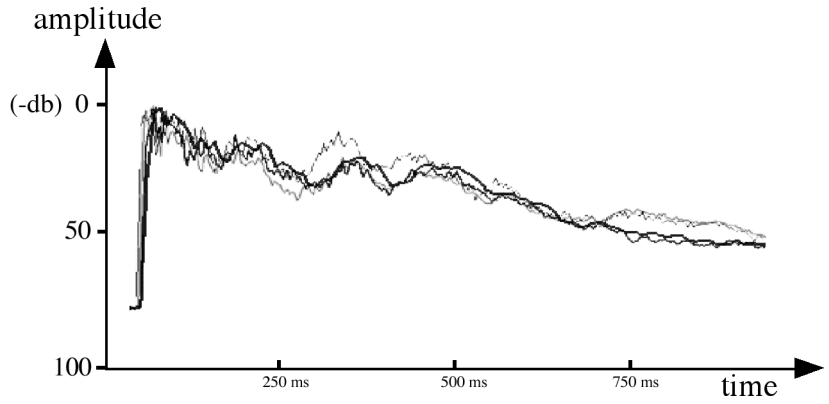


Fig. 5.11 Envelopes of the tone c^1 (262 Hz) played on the Steinway with different degrees of pedal (1/6 pedal, 1/4 pedal, 1/2 pedal and full pedal). The darker lines indicate the envelopes of tone played with fuller pedal.

The analysis of the envelopes seems to support the position that the use of the pedal does not amplify the piano sound at least in the case of middle *c*. This also means that if the use of the full pedal increases the amplitude, the partially depressed pedal cannot have a remarkable influence on the amplitude. The partially depressed pedal has the most significant effect if the dampers are as close as possible to the strings (in case of a 1/6 pedal). It should be added that a 1/6 pedal does not make the sound weaker in

comparison with the full pedal and it is even stronger during a specific period.

5.4 THE SPECTRUM OF A SINGLE TONE

In chapter 4, I mentioned that another component determining the timbre of the sound in addition to envelope is the spectrum. To find out whether the sound spectra cause some differences in the timbre of the Liszt-time and modern pianos, we have to compare the spectra of the two. The second subject discussed in this section is the influence of the pedal on the spectra of a single tone. Therefore, the spectra of tones played with and without the pedal will be compared as well. I have chosen for the spectral analysis three single tones in different registers played on both pianos. The length of the period for spectral analysis is 1000 ms (1 sec). As I mentioned in Chapter 4.4, more harmonics can be detected in the low register than in the high register. Nevertheless, the spectral diagrams of the study present only the first ten partials of each single tone in all registers.

Diagrams 5.3-5.5 indicate that there are some differences between the spectra of Liszt-time and modern pianos. The dissimilarities are more significant in the bass and middle registers. The most considerable difference in the bass spectra (Diagrams 5.3a and 5.3b) can be found in the level of 7th harmonics. The level of the 7th partial is much stronger on the Steinway than on the Chickering. In the middle, there are dissimilarities in the relations between the 3rd and 4th overtones. The 4th harmonics in relation to the 3rd overtone is weaker in the Chickering tone (Diagram 5.4a) and stronger in the Steinway tone (Diagram 5.4b). The diagrams also indicate that the relations of the first four harmonics in the spectra of the middle (Diagrams 5.2a and 5.2b) on the Chickering and the Steinway are in converse. In the spectra of the Chickering tone, the second harmonics are stronger than the first and the third stronger than the second. In the Steinway spectra, on the contrary, each subsequent partial of these three is weaker than the preceding one. In the treble (Diagrams 5.5a and 5.5b), the sound spectra of the two pianos are almost identical. Each subsequent partial is weaker than the one preceding it.

An analysis of these diagrams cannot determine exactly how much these small dissimilarities in spectra influence the sound quality, but it seems that the differences in timbre of the two pianos can be better explained by the

dissimilarities of envelopes. In other words, the speed of amplitude decay of each single tone is a factor, which makes for a certain piano-specific sound quality.

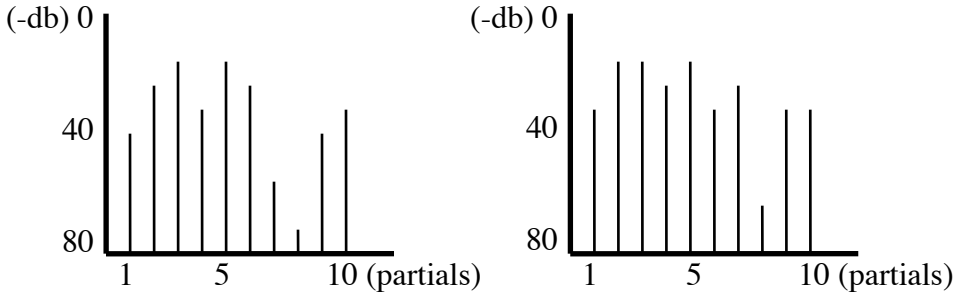


Diagram 5.3 a) Spectrum of *C2* (65 Hz) played on the Chickering without pedal; b) Spectrum of *C2* (65 Hz) played on the Steinway without pedal.

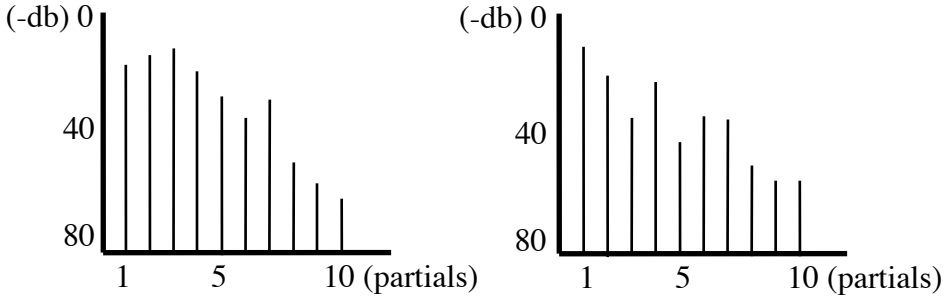


Diagram 5.4 a) Spectrum of c^1 (262 Hz) played on the Chickering without pedal; b) Spectrum of c^1 (262 Hz) played on the Steinway without pedal.

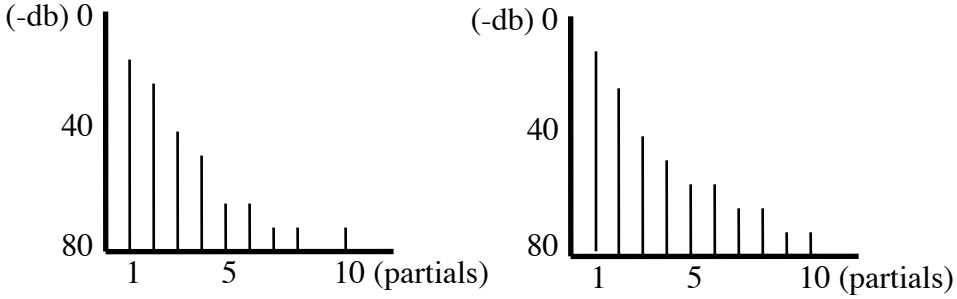
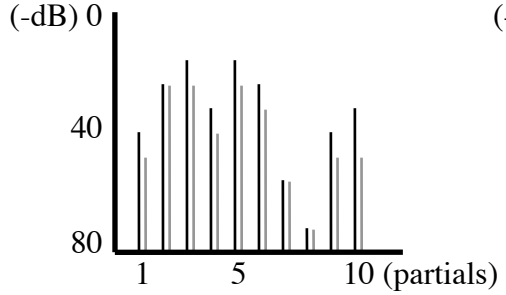


Diagram 5.5 a) Spectrum of c^3 (1047 Hz) played on the Chickering without pedal; b) Spectrum of c^3 (1047 Hz) played on the Steinway without pedal.

In Chapter 4.5, it was mentioned that the use of the pedal has an influence on the timbre of the piano. To find out how much the use of the pedal affects the spectra we should compare the spectral diagrams of the tones played with and without the pedal. In Diagrams 5.6-5.8, the black lines indicate the partials of tones played without the pedal and grey lines indicate the partials of tones played with the pedal. It seems that, contrary to what I supposed, the influence of the pedal on the spectral constellation is not considerable. It may appear at first that, in case of the bass tone on the Chickering, the use of the pedal has some influence on the spectra (Diagram 5.6a). After closer investigation, however, it would seem that all partials in the spectrum of the tone played with the pedal (grey lines) are weaker than those of the tone played without the pedal (black lines). Thus, this tone probably sounds louder when pedal is not depressed.



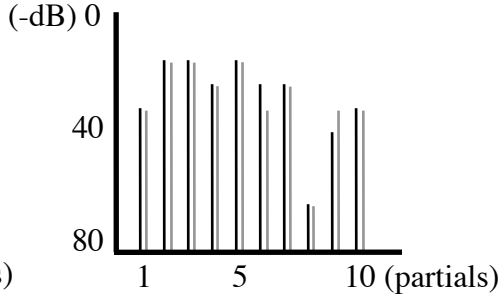
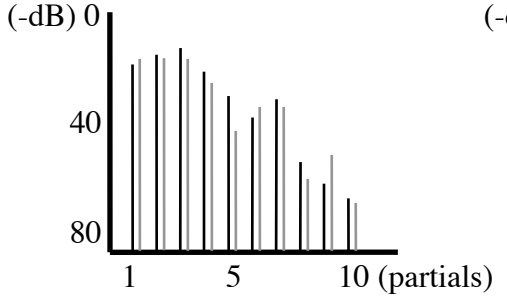


Diagram 5.6 a) Spectrum of *C2* played on the Chickering without pedal (black) and with pedal (gray)

b) Spectrum of *C2* played on the Steinway without pedal (black) and with pedal (gray)



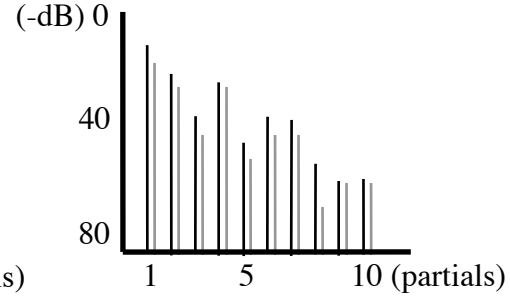


Diagram 5.7 a) Spectrum of c^1 played on the Chickering without pedal (black) and with pedal (gray)

b) Spectrum of c^1 played on the Steinway without pedal (black) and with pedal (gray)

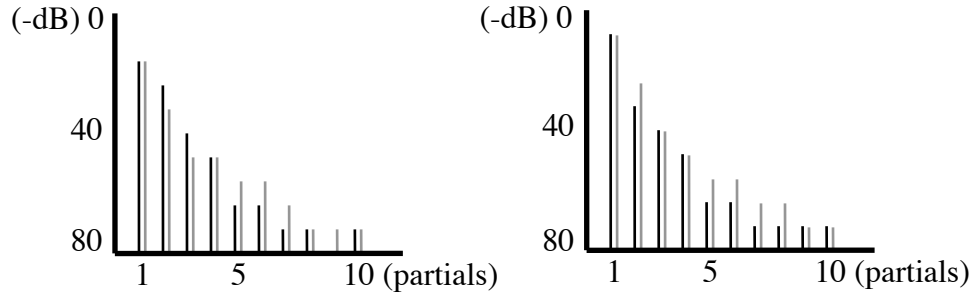


Diagram 5. 8 a) Spectrum of c^3 played on the Chickering without pedal (black) and with pedal (gray)

b) Spectrum of c^3 played on the Steinway without pedal (black) and with pedal (gray)

Because the envelope seems to play a more important role in determining the timbre of the pianos from different periods, I will focus mostly on the envelope of the piano sound in the following chapters of this study. In addition, we should not forget that the slower decay in the loudness of the Steinway tone seems to be the primary cause of the problematic blurred sound.

5.5 SUMMARY

Having analysed the envelopes presented in this chapter, we can conclude that differences between the envelopes of Liszt-time pianos and modern pianos constitute an important factor that causes the dissimilarity in their sound quality. The envelopes of both pianos in all registers differ remarkably in two aspects. The first dissimilarity can be detected in rise time of the attack transient and the second in the speed of the amplitude decay after the attack transient. In the case of the Chickering, the attack transient endures longer and the decay of amplitude after the peak point is always much faster than on the Steinway. Thus, the sound onset and decay rates of the Chickering tones are more similar to each other than those of the Steinway tones.

The results of the analysis regarding the influence of the pedal on the loudness of a single tone are somewhat unexpected. In section 5.3, we

analysed 6 pairs of envelopes. As we do not have any numerical data on the average loudness of tones, I cannot present any corresponding exact statistics. Nevertheless, we can draw some conclusions about the influence of the pedal on the loudness of single tones based on a visual comparison of the envelopes. We saw that the envelopes of tones played with the pedal and tones played without the pedal are not identical. On the other hand, these envelopes indicate that the use of the pedal does not remarkably increase the loudness of a single tone. In two cases, the bass and the middle on the modern Steinway, the use of the pedal seemed to have no effect at all on the average loudness of a single tone. In another two instances, the bass and the treble on the Chickering, the use of the pedal slightly increased the average loudness of a single tone. In two cases, the middle on the Chickering and the treble on the Steinway, the use of the pedal slightly decreased the average loudness of a single tone. The loudness decreasing and increasing effects of the pedal are distributed evenly across those 6 pairs. Therefore, the term *loud pedal* is not an appropriate name for the damper pedal because the pedal does not make the sound louder in case of a single tone. We have seen that in some cases the pedal even reduces the loudness of a single tone.

6

ACOUSTICAL ANALYSIS OF THE PEDAL IN LISZT'S WORKS

6.1 ABOUT THE ANALYSIS

In Chapter 5 I analysed single tone envelopes. In the present chapter I will use the same method of analysis on some of the late piano works by Liszt. The envelopes of some examples of problematic pedal indications played on the Chickering and the modern Steinway are presented and analysed. As I have mentioned before, in my practice I have used a partially depressed pedal as one possible solution to realising the effects originally intended to be generated by a long pedal. Thus, in the present chapter I also observe the envelopes of examples of pedal effects played on a modern Steinway piano with a partially depressed pedal. Similarly to Chapter 3, the examples discussed in the present chapter are divided into two categories: examples of effects generated by a long pedal and those generated by releasing the pedal. In the first category, I examine the pedal's influence on the envelope in different registers. As I have written before, the most challenging problems in realising Liszt's original pedal indications on a modern piano are encountered in the low register. Thus, the examples of pedal effects are chosen from works where the texture is in the low and middle registers. In

the treble, such confused sound effects do not appear, and therefore examples of pedal use in the high register are not presented.

6.2 THE EFFECT OF THE PEDAL ON LOUDNESS

In Chapter 5 I have addressed the inaccuracy of the term *loud pedal* in the case of a single tone. As has been reported, using the pedal does not increase the loudness of a single tone. The situation becomes more complicated when more than one tone or chord is played with a depressed pedal. When playing several tones under the pedal, we have to distinguish between two types of cases. The first type involves situations where one and the same tone or chord is to be repeated with a depressed pedal. The second type concerns situations where several successive tones with different pitches are to be played under pedal. The pedal effect is rather different between these two types of cases. The use of the pedal is more perceivable in the latter type.

A piano string gets an impulse from the hammer, and when the pedal is depressed, the string's vibration continues even after the finger has released the respective key. As has been mentioned in Chapter 4.5, strings that have a harmonic relation with the string struck by the hammer resonate as well. Sympathetic overtones have an impact on the quality, but not necessarily on the loudness of the sound. At the same time, the continual striking of one and the same string by the hammer does not increase the amplitude of the string's vibration. The reason is that at the moment when the hammer strikes the string, the string's vibration always stops for a short while, even if the pedal is depressed. Thus, the playing of a subsequent tone does not add to the loudness of a previous tone. In this situation the only strings that continue vibrating are the sympathetic strings.

The question whether and by how much loudness increases where several different successive tones are played under a long pedal is much more complicated.[1] Where different consecutive tones are played under a depressed pedal with the same loudness, the listener might easily have the impression that the volume increases. Where the number of active, vibrating

[1] The loudness of combined sounds depends on many factors; how close they are to each other, for instance. T. D. Rossing has explained the process of calculating the loudness in *The Science of Sound*. (Rossing 1989: 97-99)

strings increases, the sum of the vibrations has an impact on the sound. In reality, however, the amplitude of the vibration does not necessarily increase. What happens is that only the range of sound frequencies widens. Due to the auditory effect, however, the listener gets the perception that the volume of the sound might have increased.

In Chapter 4.5 I stated that pedal use influences the timbre of the piano. Although pedal use influences sound quality, the listener may not always perceive the change in timbre, especially where it has to do with repeating a single tone or chord. When a tone or a chord is repeated we can probably hear whether the pedal is depressed or not. The reason for this is not the quality of the sound generated by the pedal, but the fact that the pedal always connects a tone with the next tone (chord). When one plays two or more tones or chords in succession one always has to release the key(s) before playing the next tone or chord. When the pedal is not depressed the dampers fall onto the strings, causing breaks in the sound that we hear.[2]

6.3 PEDAL USE IN THE BASS REGISTER

In Chapter 3.4 I stated that the realisation of Liszt's long pedal effect on a modern instrument is most problematic in cases where the texture is in the low register. The aforementioned chapter contains two examples belonging to this pedal effect category. Both of the examples are taken from the piano piece *Marche funèbre*, and are among the most characteristic illustrations of problematic pedal effects. In Bars 10-13 of *Marche funèbre* (Example 3.7) the pianist must keep the pedal depressed over a fairly long period. At the

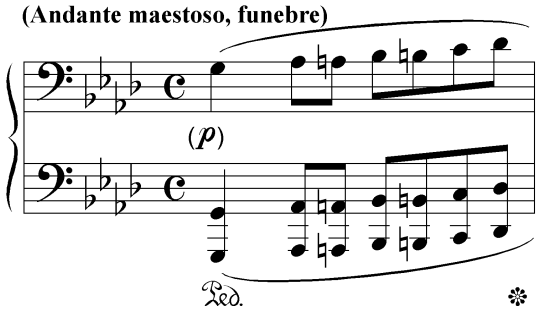
[2] To see how difficult it is to perceive pedal influence on sound quality, we can do an experiment. In the experiment we are expected to use the *sostenuto pedal* (the middle pedal). We are to repeat one and the same tone or chord in two ways: under depressed (right) pedal and under depressed *sostenuto*-pedal (middle pedal). (If the piano has no *sostenuto pedal*, it would be possible to perform the experiment by holding up, with a hand or with some other tool, the dampers of the strings played. Under the *sostenuto pedal*, only those dampers activated by its mechanism are raised, and the other strings do not resonate (the spectral constellation is not enriched by sympathetic overtones). Therefore, the quality of the sound does not change either. When we listen to these two variants – under *sostenuto* pedal and under (right) pedal – we hear no remarkable differences in sound quality.

same time he has to play many (18) chromatic tones in the low register. If we present the envelope of the example, it would be almost impossible to read from the graphics the peaks and attack transients of these tones. Thus, the present chapter deals only with the envelope characteristics of Bar 28 of *Marche funèbre*. In this example (6.1), too, the chromatic rise of the octaves in the low register is to be played with a depressed pedal, yet it is possible to observe the attack transients of almost all the tones in the envelope of this short fragment.

When we examine the envelopes presented in Figure 6.1, we find that the loudness of each tone decreases in accordance with the same principles as that of a single tone. In other words, even in the example of long pedal, the loudness of each tone decreases faster on the Chickering piano than on the Steinway. On the Chickering piano (Figure 6.1a) the attack transient of each tone is clearly distinguishable, except for the third tone of the example. In the case of that particular tone, the reason is not the acoustical properties of the historical piano, but the relatively soft playing of the tone during the recording. Unlike the Chickering piano, when the pedal is depressed all the way down on the Steinway (Figure 6.1b) it is not easy to observe the beginning of each chromatic tone. Recognizing the peaks of the first four tones in the figure is not complicated, whereas identifying the attack transients of the last tones is not easy. In this particular case it seems that the two last tones have been played relatively softer on the Steinway than on the Chickering.[3]

Next, let us examine how a partially depressed pedal (played on a Steinway) influences sound clarity in bar 28 of *Marche funèbre*. Figures 6.1b-e present the envelopes of this example played on a Steinway under different degrees of pedal depression. As expected, recognising a tone is easier the faster the amplitude level of the preceding tone decreases. In other words, the difference in loudness between the end of a tone and the beginning of the next tone is a factor, which plays an important role in the process.

[3] It needs to be noted that where some of the tones are played relatively louder or softer it influences the ease or difficulty in visually detecting the attack transients of these tones in the envelope. On the other hand, my experience of listening to these examples tells that such relatively small and accidental differences in tone loudness have no influence on the general degree of sound clearness.



Example 6.1 Bar 28 of *Marche funèbre* (*Années de pèlerinage III)*.

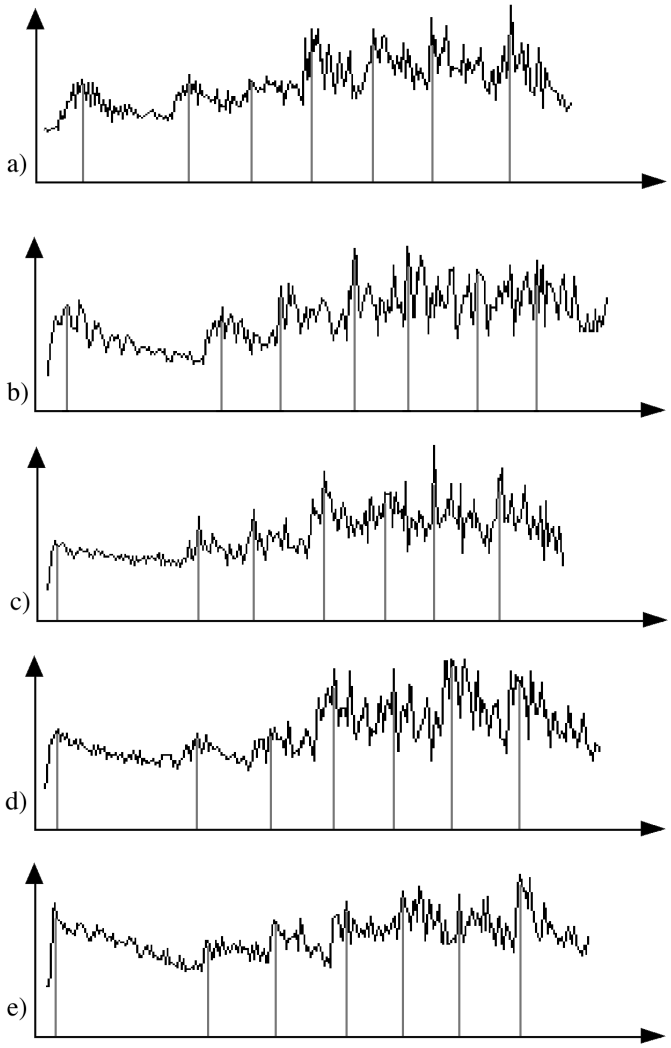


Figure 6.1 The envelope of Bar 28 of *Marche funèbre* played on the a) Chickering with full pedal, on the Steinway b) with full pedal, c) with 1/2 pedal, d) with 1/4 pedal, e) with 1/6 pedal. Gray upright lines indicate tones' peaks.

It should be mentioned that in case of a partially depressed pedal the level of depression is not the only factor that makes the visual recognising of tones peaks easier. The loudness of each particular tone also influences the profile of the tone's peak. Nevertheless, as seen from the diagram, the degree of pedal depression seems to have some, but not a remarkable, effect on the loudness reduction rate. Observing figure 6.1b we can find that the recognition of peaks in the case of a fully depressed pedal seems to be the most problematic, especially by the second half of this bar. In other words, under lesser degrees of pedal depression (1/6 pedal) it is easier to determine the attack transients of the tones. From Figure 6.1 we can also see that the increases in tone loudness in the second half of Example 6.1 are not as conspicuous under a 1/6 pedal as under a 1/2 and 1/4 pedal. If I were to make a *crescendo* of the same magnitude under each of the pedal depression degrees, the shape of the attack transient of each tone would probably be best visible under the 1/6 pedal. Nevertheless, the difference in envelope shapes in Example 6.1, played under full pedal and (on the Steinway) under different degrees of partially depressed pedal, is not that huge. At the same time, a partially depressed pedal has an effect on sound clarity that is greater the closer the dampers are to the strings, that is, it is strongest when using a 1/6 depression of the pedal.

We can observe from the figure that the level of the first tone in this example, played under a 1/6 pedal on the Steinway (Figure 6.1e), appears to decrease slightly faster than under a 1/2 pedal (Figure 6.1c). On the other hand, we cannot conclude that in the case of the first tone of this example the lesser depression of the pedal causes a faster decrease in loudness. In Chapter 5.3 we have seen that the use of the pedal (including the partially depressed pedal) does not have a remarkable influence on the decreasing speed of a single tone. At first glance, the situation by the first tone of Example 6.1 reminds us of the situation we can find by a single tone (I'm not sure what this sentence means). No previously depressed tone sounds simultaneously with this tone. On other hand, at the beginning of bar 28 of *Marche funèbre* three tones in octave relation must be played at the same time, and the first peak of Figure 6.1 indicates the sum of loudness of all three simultaneously played tones. These three tones have different pitches and as we have seen in Chapter 5.2, tones in different registers decrease at different rates. We know that higher tones decrease faster than lower ones. When several tones are played at the same time, the envelope indicates the

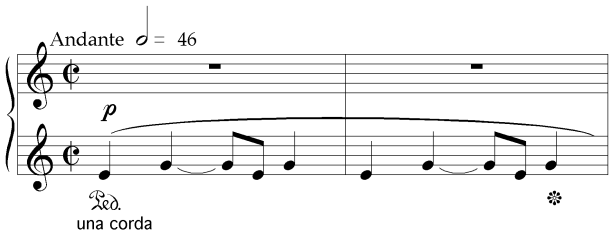
amplitude of the loudest one.[4] If the highest tone were played louder, the falling of envelope's shape would be steeper than if the lowest tone were played louder. Thus, I can conclude that while using the 1/6-pedal (Figure 6.1e), I have played the highest *G* (*G3*–196Hz) louder than the lowest one (*G1*–49Hz). In case of the 1/2-pedal (Figure 6.1c), to the contrary, I have probably played the lower *G* relatively louder than higher octaves.

6.4 PEDAL USE IN THE MIDDLE REGISTER

Unlike bar 28 of *Marche funèbre* (Example 6.1), the use of full pedal in the beginning of *Wiegenlied* (Example 6.2) does not result in a blurred sound on either piano. The playing of tones under a long pedal in the middle register practically does not cause any significant difficulties for recognising either the pitch or other properties of the tones. In Example 6.2, there may be two reasons for that. First, the loudness of the tones in this example (in the middle register) decreases quickly enough and provides better conditions for perceiving the beginning of the next tone and recognising its properties. Second, the beginning of *Wiegenlied* consists of only two different pitches. The interval (minor third) between these is consonant.

Figure 6.2 presents the envelopes of *Wiegenlied* played on both pianos. From the figure we can observe some dissimilarities between the envelope profiles for the Steinway and the Chickering (Figures 6.2a and 6.2b). As I have mentioned before, when recording these examples it would be practically impossible to play all the tones at the same volume. In this figure, too, the decrease in the amplitude of each tone is the only property that provides a reliable result when compared. According to Figure 6.2, in the Steinway envelope the amplitude levels of the third and seventh tones did not decrease as fast as in that of the Chickering. In other words, on the Steinway the loudness of the short tones (eighth notes) did not decrease as much as that of the long ones by the time the next tone was depressed. Nevertheless, the attack transients of the fourth and eighth tones in Example 6.2 are apparent enough both to the eye in the envelope's graphics and to the ear in the recorded example.

[4] Actually the determining of the loudness of many simultaneously sounding tones is more complicated. For determining loudness in cases of two or more tones there exists three formulas depending on how close they are to each other in frequency. (Rossing 1989: 97-99)



Example 6.2 The beginning of *Wiegenlied* by F. Liszt.

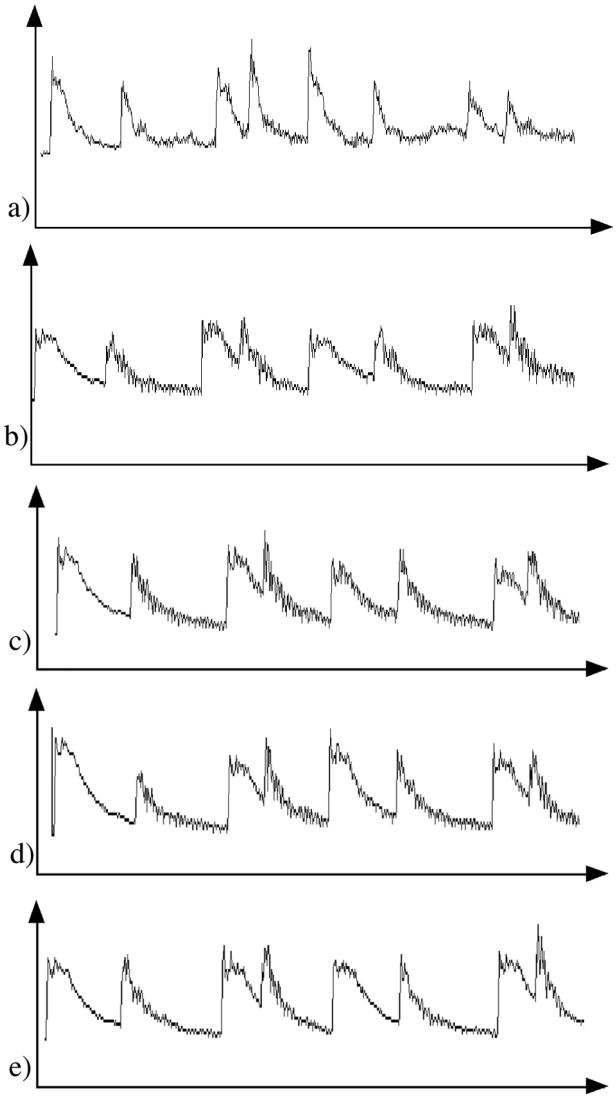


Figure 6.2 The envelope of the beginning of *Wiegenlied* played a) on the Chickering; b) on the Steinway with full pedal; c) on the Steinway with 1/2 pedal; d) on the Steinway with 1/4 pedal; e) on the Steinway with 1/6 pedal

As we saw in the previous section, the use of a partially depressed pedal (1/6 pedal) may have some effect on sound clarity in the low register. The beginning of *Wiegenlied* is an example where the observance of the original pedal indications did not result in a concomitant blurred sound. At the same time, a comparison of the loudness reduction rates from the third tone to the moment the next one (fourth tone) was played, for instance, did not reveal any significant differences between the four versions (b, c, d and e) in Figure 6.2. Thus, even if the long pedal in the middle register causes a blurred sound, a lesser degree of pedal depression in Example 6.2 would not add the sound clarity. As this melody comprises only two different pitches, we can view this example, at least in some sense, as one where several successive single tones are played.

In Chapter 5.3 we saw that in the envelopes of single tones in the middle register (Figures 5.5–5.10) practically no difference could be detected between the tones played under pedal and under no pedal. In other words, based on an analysis of single tone envelopes, pedal use does not influence the decreasing speed of a tone's loudness. Even if Example 6.1 had been played under no pedal at all, there would have been no significant changes in the reduction rate of the envelope.

6.5 THE INFLUENCE OF THE PEDAL ON THE LINEARITY OF THE MELODY

Although the beginning of *Wiegenlied* played on a modern Steinway piano reveals no problems in sound clarity, we can still hear some mutation in the texture of the example. The pedal sign at the beginning of the example means a sustained sounding of two notes in the two initial bars. In some sense, the melodic and harmonic natures of the phrase are confused. An effect is created where two different notes sound simultaneously, while their loudness balance changes continuously.

Played on the historical piano, the result reminds one more of a one voice melody *legato* (a single melody). In other words, the attack transient of each tone grows out of an almost identical level of loudness and the attack transients of all the tones have a similar profile. In Figure 6.2b we can see that the third tone dominates the initial fragment of the attack transient of the fourth tone. In my opinion, when we perceive the present fragment (Example 6.2) as a one voice (single) melody, we get the impression of a

better *legato*. In Figure 6.2a we can see that the attack transient of each tone begins from almost the same level. According to Figures 6.2a and 6.2b, the one voice melody was achieved more successfully on the Chickering. In other words, the loudness of each note had dropped to an almost identical level before the next one was played.

In Example 6.2 there are three different units of rhythm: eighth notes (the 3rd tone in both bars), quarter notes (the 1st and the 4th tone) and a dotted quarter note (the 2nd tone). The loudness of the tones at the moment the next tone was played is different. The envelope of the longer rhythm units drops to a lower level than that of the shorter ones. This influences the balance between these two tones. The moment the 2nd tone (g^1) of *Wiegenlied* was depressed, the loudness of the previous tone, e^1 (played a quarter before), was weaker than the e^1 level upon striking the string of the 4th tone. In the last case e^1 had been played only an eighth note earlier whereas the first e^1 had been depressed a quarter note earlier. From this point of view the most critical moment was probably during the 4th tone in this example, because the loudness of the 3rd tone was still relatively high at that time.

Nevertheless, in my experience the use of a long pedal in the beginning of *Wiegenlied* damages the linearity of the melody to some extent even on an old piano. It is not easy to figure out what role the composer had intended for the *legato*. In Bars 3 and 4 of *Wiegenlied* the same initial motive is repeated, but the tone g^1 is replaced with a^2. The left hand parts in Bars 5 and 6 are identical with those in the first two bars. In the beginning of Bar 5 a new melody is introduced for the right hand. From this point on the motive for the left hand may be regarded as either an independent melody in counterpoint with that for the right hand, or as a recurring *ostinato* theme. The latter case does not necessary require that an ideal *legato* be achieved. This raises the question: was the idea of a linear *legato* more important to the composer than the multiplicity of the texture produced by the pedal?

We can find the clue to this problem by studying the orchestration of these bars. Liszt composed an orchestral work *Von der Wiege bis zum Grabe*[5], the first movement of which bears very close resemblance to the piano piece

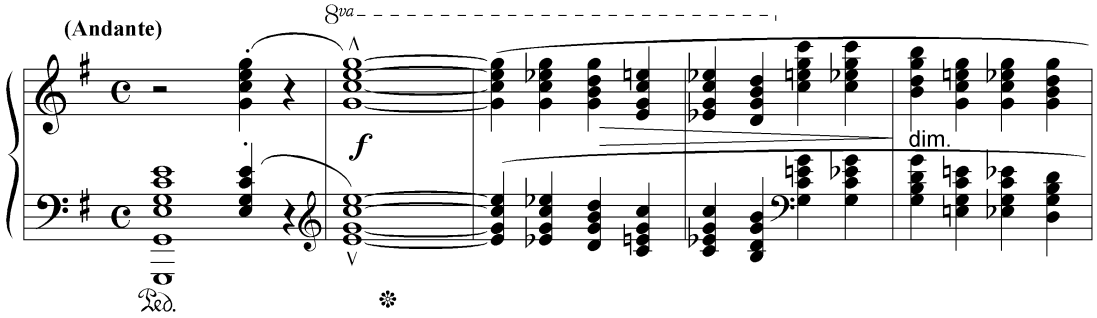
[5] The piece *Von der Wiege bis zum Grabe* was originally written for *piano solo* in 1881. Shortly after that, Liszt composed a *piano duet* version. This version deviated from the *piano solo* version, which Liszt later revised to make it agree with the *piano duet* version. From this form of the *solo* version, an orchestral version was also prepared. (Suyok, Mesŏ: 1981, Vol. I/17, xiii)

Wiegenlied. The beginning of the orchestral work is absolutely identical to *Wiegenlied*. The initial motive of *Von der Wiege bis zum Grabe* was written for violas. When the violins start to play a new melody in Bar 5, the viola theme is continued as a contrapuntal *legato* melody. In the beginning of the orchestral work, violas play two bars in one bow movement, which in most cases also means *legato*. Given the long bow movement, it seems improbable that rhythmical accents should be made inside a long *legato* line in this situation. Thus, we may suppose that in the beginning of *Wiegenlied* the composer's intention was not to create an *ostinato* rhythm but a linear singing melody with a smooth *legato*. In the piano version, what Liszt may have primarily intended by the use of the pedal was creating some sound colour.

6.6 THE EFFECT OF PEDAL RELEASE ON THE ENVELOPE

In the present section I deal with pedal effects written by Liszt that are produced by releasing the pedal. In Chapter 3.5 I presented four examples of this kind of pedal effect. For further analysis I have chosen an example (6.3) from the work *Aux cyprès de la Villa d'Este (Thrénodie I)* in *Années de pèlerinage III*. In the other three examples (3.10-3.12) of Chapter 3.5 the releasing of the pedal occurs at the moment when some pianos keys are to be depressed. In this situation it would be practically impossible to distinguish between the effects of pedal release and key depression on the envelope.

In the first two bars of Example 6.3, three chords in *C* major in different registers are to be played rather loudly under depressed pedal. When the third chord (in a relatively high register) has sounded for a while, the pedal is to be released to break the sounding of the first two chords. The tones of the third chord are to be held by fingers. The dampening of all strings below the tone e^1 causes a sudden drop in loudness. In general, this kind of dynamic contrast is not exceptional in music; neither does it produce any blurred sound in this example. However, as we have seen in Chapter 3.5, the intention of the composer in Bar 202 of Example 6.3 was not a sudden drop in loudness. In Chapter 5.2 it was mentioned that the loudness of bass tones decreases at a lower rate than that of treble tones. As the chords whose sounds are broken by pedal release are located in the low register the contrast in the dynamics is therefore sharper in this example.



Example 6.3 Bars 201-205 of Aux cyprès de la Villa d'Este, Thrénodie I (Années de pèlerinage III).

Before we go on to study the effect of pedal release on loudness as played on different instruments in Example 6.3, we have to return to the differences in the envelopes of a single tone (Part 5). Based on the analysis of a single tone (Chapter 5.2), loudness decreases faster on the Chickering than on a modern piano in every register. It is therefore logical that in Bars 201-202 of *Aux cyprès de la Villa d'Este* the decrease in the loudness of the chords up to the moment of pedal release is also different on the two pianos. On a historical piano the drop in loudness before the pedal release indication is big enough for the contrast in loudness before and after pedal release to be quite insignificant.

Figure 6.3 shows the envelopes of Example 6.3 played on the two different pianos. The first bigger peak represents the lowest chord, the second peak the next chord in the middle register and the third one the chord in the treble register. The loudness reduction rate for all the chords on different pianos is equivalent to the envelopes of the single tones presented in Chapter 5.2. It appears from a comparison of the envelopes from the third chord to pedal release that the loudness on the Steinway decreased at a more even rate, whereas on the Chickering it dropped quite abruptly. The moment of pedal release is more apparent on the Chickering (Figure 6.3a) than on the Steinway. In Figure 6.3a we can even see a small, almost imperceptible peak (wave) between the last two stronger peaks. This could not be produced by the damping of the strings. Hence, this small peak in the envelope was most probably produced by some mechanical noise in the pedalling. On the Steinway, the pedal release occurred the moment the small saw teeth-like

waves end (in the envelope). Although the pedal release on the modern piano produced a greater drop in loudness, it is hardly detectable in Figure 6.3b.

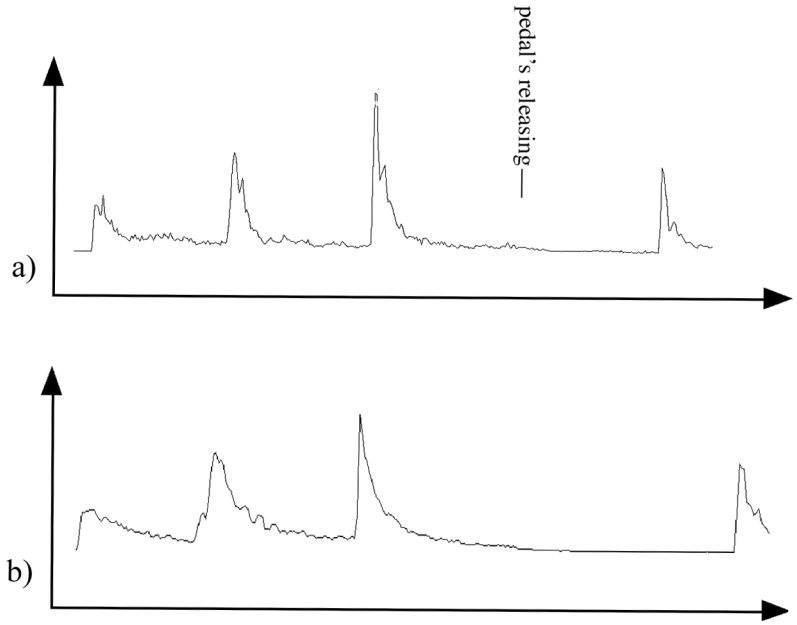


Figure 6.3 The envelope of Bars 201, 202 and the first chord of Bar 203 from the work *Aux cyprès de la Villa d'Este* played on a) the Chickering, b) the Steinway.

A visual comparison of Figures 6.3a and 6.3b at the moment of pedal release in this example is complicated. The pedal release can be observed approximately halfway between the last two peaks. Its visual effect in the envelope fails to accurately reflect its acoustic effect in this example. In Chapter 5.2 some of the properties of the piano envelope have been described. After a relatively strong attack transient, the loudness of a piano starts to decrease, and the decrease rate depends on the frequency. When the amplitude level has dropped to about 35% of the maximum (at the attack transient) the dropping rate decelerates and loudness continues to decrease at a less noticeable pace. In *Aux cyprès de la Villa d'Este* the distance in time between pedal release and each chord in Bars 201-202 is, at least on the Chickering, long enough for the loudness level to drop to 35% of the maximum. Thus, at the moment the dampers fall on the strings the loudness level is already rather low, and the pedal release does not result in a significant drop in loudness. The reason the release of the dampers cannot be detected from the graphics of the envelope as clearly as by auditory sensation is probably that the envelope shows the amplitude of the strongest

vibrating frequency. When the vibration of the selected strings was suddenly damped, the envelope still showed the vibration amplitudes of the strings that were not damped. Thus, if the range of vibrating frequencies becomes narrower the listener perceives it as a decrease in loudness. In *Aux cyprès de la Villa d'Este* this means that raising the pedal cuts off all frequencies lower than 330 Hz (e^1).

6.7 THE RELEASE OF PARTIALLY DEPRESSED PEDAL

As I stated in Chapter 5.3, the use of the pedal does not increase the loudness of a single tone. Thus, the use of a partially depressed pedal instead of a fully depressed pedal cannot have any remarkable effect on the loudness reduction rate. Nevertheless, in a piece of music where several chords are to be played the influence of a partially depressed pedal can be dissimilar compared to a single tone. If a partially depressed pedal accelerates the decrease in loudness, the undesirable contrast produced by the release of the pedal is not so significant. Next, I examine the influence of the degree of pedal depression on dynamic contrast in *Aux cyprès de la Villa d'Este*, where several simultaneous and successive tones are to be played in different registers.

Figure 6.4 presents the graphical envelopes of Example 6.3 played on the Steinway under different degrees of pedal depression. In the previous section we found that the visual effect of the pedal release is quite unnoticeable in the envelopes. The same phenomenon can also be observed in Figure 6.4. Nevertheless, when we measure the exact level of amplitude at certain points we can detect small differences in the influence of the degree of pedal depression on the level of contrast caused by the pedal release. For that purpose we have to compare four figures.[6] To follow the changes in loudness, I have chosen three points in each envelope: the maximum of the attack transient of the chord in Bar 202 (A), 1.000 ms after the maximum (B) and 3.000 ms after the maximum (C). The pedal release occurs somewhere between the last two points in these envelopes (1.800-2.000 ms after the attack transient of the chord in Bar 202).

[6] Figures 6.3a, 6.4a, 6.4.b and 6.4c.

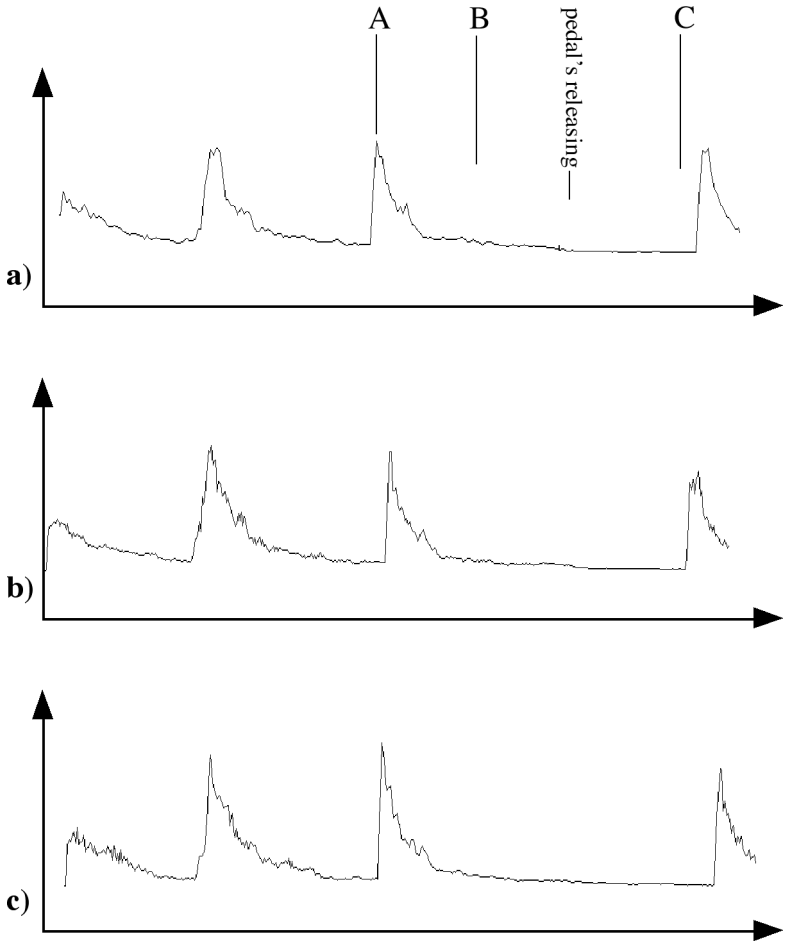


Figure 6.4 The envelope of Bars 201, 202 and the first chord of Bar 203 from *Aux cyprès de la Villa d'Este* played on a modern Steinway under a) 1/2 pedal; b) 1/4 pedal; c) 1/6 pedal.

Had I been able to play the chord in Bar 202 of Example 6.3 on the modern Steinway with exactly the same loudness on all four occasions (under full pedal, 1/2 pedal, 1/4 pedal and 1/6 pedal), a comparison of the sound pressure level (SPL) measured at certain points before the pedal release and a point after it would have yielded a reliable result. As could be expected, I did not succeed in recording these four versions of the chord at exactly the same level of loudness; neither was this my primary intention. Therefore, I also have to take into account the loudness level of the chord in Bar 202 (Point A), the decrease in the level at Point B and the influence of pedal release on the loudness level. My hypothesis is that if a lesser degree of pedal depression accelerates the loudness reduction rate from Point A to Point B in example 6.3, the contrast in the dynamics caused by the pedal release is smaller.

The second, third and fifth columns of Table 6.1 show data on the SPL measured at these three points. The loudness level at the attack transient (the second column of the table) indicates how loudly the chord in Bar 202 was played. The fourth column shows how much the loudness decreased from Point A to Point B. The sixth column of the table presents similar data on the loudness reduction rates from B to C.

Pedal degree	SPL at A (dB)	SPL at B (dB)	Decrease from A to B	SPL at C (dB)	Decrease from B to C
1 pedal	70,6 dB	50,4 dB	-20,2 dB	30,9 dB	-19,5 dB
1/2 pedal	67,6 dB	48,9 dB	-18,7 dB	32,6 dB	-16,2 dB
1/4 pedal	69,6 dB	48,4 dB	-21,2 dB	33,1 dB	-15,3 dB
1/6 pedal	69,6 dB	47,4 dB	-22,2 dB	30,9 dB	-16,5 dB

Table 6.1 Sound pressure level measured at three points in Example 6.3 (*Aux cyprès de la Villa d'Este I*): at the attack transient of the chord in Bar 202 (A), at 1.000 ms later (B) and at 3.000 ms later (C), played on the Steinway under different degrees of pedal depression.

As we can see from the table, the sound pressure level of the chord in Bar 202 range between 70,6-67,6 dB in these four cases. When we study the differences in SPL between A and B, we find that the SPL level at Point A may have some effect on the SPL reduction rate. I played the chord in Bar 202 the softest under a 1/2 pedal (67,6 dB), and, in absolute values, the decrease in its SPL over one second was the smallest (18,7 dB).[7] If we compare the percentages of loudness reduction (and exclude the data on the 1/2 pedal), we find that lesser degrees of pedal depression accelerate the decay rate. The most reliable result may probably be obtained by comparing the absolute reduction in SPL between the two lowest rows in Table 6.1. The chord in Bar 202 was played at exactly the same level of loudness under both 1/4 pedal and 1/6 pedal. Thus, it is easy to compare the changes in their SPL. We can see from the two lowest rows in Table 6.1 that the lesser degree of pedal depression accelerated the decay rate. The decay in SPL from Point

[7] As the chord in Bar 202 was played much more softly under 1/2 pedal than under the other degrees of pedal depression, we cannot give much consideration to the data on the 1/2 pedal when drawing conclusions.

A to Point B over 1.000 ms was greater by 1 dB under 1/6 pedal than under 1/4 pedal. Thus, although the difference is not significant, the use of a partially depressed pedal accelerates the loudness reduction rate on a Steinway piano.

To examine the influence of pedal release on dynamic contrast under different degrees of pedal depression we have to compare the difference in loudness measured at Point B and Point C. The distance in time between these two points is 2.000 ms (2 seconds). This period of time includes the moment of pedal release. The last column of Table 6.1 shows the decrease in SPL over this particular period of time in absolute values. Under the full pedal, the difference from the SPL measured at the previous point is 19,5 dbB whereas under 1/6 pedal it is 16,5 dB over the same period of time. Based on the Table 6.1, the dynamic contrast is smaller under a partially depressed pedal. Thus, pedal release leads to a smaller contrast under lesser degrees of pedal depression. The only exception to the rule is the level reduction under a 1/6 pedal. Nevertheless, under a 1/6 pedal the contrast in dynamics produced by the pedal release is remarkably smaller than when using the full pedal. The difference is 3 dB.

7
SOME SUGGESTIONS FOR REALISING LISZT'S LONG PEDAL EFFECTS ON THE MODERN PIANO

7.1 INTERPRETATION OF PEDAL MARKINGS

Since this study presents some suggestions for the interpretation of pedal markings, it is thus necessary to discuss certain aspects of the interpretation. It was mentioned in Chapter 4 that every musical sound consists of four components: pitch, loudness, duration and timbre. In my opinion we can find a relation between the score indications and these four sound components. The placement of note head in the staff (equipped with a clef), for instance, determines the pitch of the tone. A particular rhythmic unit (together with a tempo indication) will influence the duration of a tone. In this way, we can find the relation between most of the score indications and the four sound components. The question of semantic connection between conventional notation and sound events, however, is another complicated issue and it would exceed the limits of this study.[1] From the standpoint of this study, it is more important to observe how the realisation of a pedal marking influences the sound and its properties.

[1] K. Kurkela has in his study *Note and Tone* presented a semantic analysis of conventional notation.

In my opinion the interpretation has to relate to the realisation of pedal markings similarly as to other score symbols. However, pedalling always involves factors that make interpreting the pedal more ambiguous than interpreting other score symbols. There are many reasons for that. Firstly, scoring of the pedal is found only in piano music and pedalling is possible only when playing the piano.[2] Therefore, the history of pedal notation is rather short when compared to the history of music notation in general. Secondly, scoring of pedal markings is optional and its use is almost never completely fixed in the score. This means that the pianist normally uses the pedal depending on his/her taste and the character of the music even when the composer has not written any pedal indications.[3] Thus, in performance practice the pedal has been used more often than it has been marked into the score. Except for some general word expressions like *col pedale*, for instance, the two most common symbols for the pedal in Liszt's time were: the "pedal on" mark and the "pedal off" mark. In practice, the realisation of the pedal signs does not simply mean the depressing and raising of the player's foot. The timing of pedal-on and pedal-off were marked in Liszt's time with some exactness, but the speed and degree of depressing (and releasing) were indicated.

Next I will examine which component of the sound is influenced by depressing the pedal. The pedal marked in the score may have different roles or purposes depending on the situation. The roles of the pedal could include, for instance, connecting two tones or chords, sustaining the harmony or creating some sound colour, etc. The pedal has the most considerable effect on two components of the sound: duration and timbre.[4] All tones played after the pedal has been depressed will sound at least until the release of the pedal

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[2] This refers only to a pedal device that raises the dampers. In the case of a harp, for instance, the pedal changes the length of the string, hence the pitch of the tone.

[3] I found an exception where the composer requires exact realisation of his pedal markings in the piano part of the song *When daisies pied* from the cycle *Four Shakespeare Songs* composed by E. J. Moeran. He has written a curious and exceptional note: "The pedal to be used exactly and only as marked."

[4] In Chapter 6, I pointed out that the use of the pedal also influences the loudness of sound in some work examples. On the other hand, we have seen from the envelopes presented in Chapter 5 that the pedal did not affect the loudness of a single tone. Thus, we can have some reservations regarding the opinion that the pedal influences the loudness of the tone.

(unless they die away sooner). It was mentioned in Chapter 4.5 that the pedal also has some influence on the sound spectra, hence on the timbre. Thus, when a composer writes a pedal indication in the score to achieve some specific sound colour, he should take into consideration that in this case the duration of the tones will be prolonged as well. We cannot know whether the composer's intention in writing a pedal sign was to create a specific sound colour or to sustain some tones. It could be possible that composer has not clearly identified the purpose of the pedal use even for himself.

In the case of Liszt's pedal effects treated in the present study, it seems that the composer's intention in most cases was the creation of sound colour rather than the lengthening of tone duration. If the pianist would like to minimise the effect of the composer-intended specific sound colour (blurred sound) on a modern piano by changing the use of the pedal or by releasing the pedal earlier, this would directly affect the duration of tones as well. One would believe that performing in such a way is not rare in performance practice. In Chapter 5.2 we discussed that the sound on a modern Steinway would have a similar degree of clearness as the Chickering when the long pedal example is transposed more than two octaves higher. Surely no pianist would use this solution. It seems that changing the pitch of the sound desired by the composer would be less preferable in playing than changing the sound duration. In my opinion, it would be incorrect to create a hierarchical order of score indications. Having equal respect for all score indications would eliminate the need to rank them on the basis of relevance. In Chapter 1.1 I have mentioned that the precondition of the present study is the following of Liszt's original pedal markings by reducing the blurred sound on the modern piano. Therefore, all my suggestions about realising problematic pedal indications presented in this chapter proceed from the standpoint that the blurred sound produced by the long pedal should not be reduced with either earlier or more frequent pedal changes.

7.2 AUTOMATICALLY MADE DECISIONS IN PERFORMING

In the present section I will deal with some matters of interpretation, which I found while comparing the examples I recorded. We know that creating an interpretation of a musical work is a complicated process. The amount of notes played by a pianist in a recital can be enormous and there are countless details that need be addressed. The beginning, loudness and end of every

tone has to be controlled. The amount of information is so large that it is impossible for the listener to be aware of every decision the player is making. In a performance many of these decisions happen automatically. To achieve this skill of automatic decision-making the player needs to work for years, as well as to gain experience in performing. It is actually often difficult to define which decisions happen automatically and which are made consciously. This depends on the pianist's experience, on the work in question, on the performing situation, etc. A beginner usually has to concentrate more on playing the correct notes, while a more experienced pianist is freer to concentrate on forming the musical phrase.

When and to what extent is pedalling done automatically? It is likely that we can find situations where a pianist concentrates consciously on each motion of his foot, as well as those where a pianist is not aware of his decisions, and that the experience of the pianist plays a role in making the decisions. I suppose that in cases where the composer has not marked the pedalling the decisions will be more automatic. At the same time even an experienced pianist may, on some occasions, concentrate on the details of pedalling. In the case of some specific pedal effects marked by Liszt, for instance, we have to give careful thought to the realization of his pedaling instructions. During the recording sessions I concentrated on following the original pedal indications and attempted to avoid any adjustments in my pedalling. Therefore, all my decisions in pedalling have been made consciously. However, when listening to the recordings I found that I had made some adjustments in other areas of interpretation, particularly in tempo and dynamics.

When planning this study my intention was not to concern myself with the dynamics or the tempo of a performance. My intention was to play all versions of the examples in as similar a way as possible, except for the amount and degree of pedalling (on a Steinway). Although we know that two exactly identical performances of a work cannot exist, my expectation was that I could, while recording these short examples, exclude or at least limit the manipulation of all other components of interpretation. To achieve reliable results in analysing the examples of Liszt's pedal effects, the best solution would be to use some playing machine or mechanical device as the performer. Fortunately I did not have the possibility to use such a machine, otherwise I would not have detected some curious relationships between pedalling and other details of interpretation. When I analysed the played examples it became quite evident that I had made lots of adjustments in

dynamics and rhythm without being aware of it. From the standpoint of the present study it is curious that the regulation of tempo and dynamics seem to connect with the pedalling. More specifically, these adjustments in tempo and dynamics mostly served the purpose of decreasing the blurred sound caused by the long pedals used.

7.3 UNINTENTIONAL ADJUSTMENTS IN TEMPO

It was seen in Chapter 5.2 that the loudness of a tone, played on a historical piano, decreased faster than one played on a modern instrument. In other words, when producing a tone with the same pitch and level of loudness on both pianos, the decrease in loudness to a certain level takes longer on the modern piano. Thus, if we have to play several successive tones with the pedal pressed down, and we would like to achieve the same clarity of sound on a Steinway as on a Chickering, we must give each tone more time. This may, in some cases, influence the performance tempo of the work: if a pianist aims for greater clarity of sound, he should perform the works by Liszt that include long pedal effects in a slower tempo on a modern piano. I make this statement with some reservations. Firstly, the whole work doesn't need to be performed in a slower tempo if problematic pedal indications only occur in a few bars of the work in question. Secondly, sometimes too slow a tempo damages the character of the work. And thirdly, problems in perceiving sound properties do not appear in all the cases of long pedal effects, but most notably when the texture is placed in the low register.

I will now examine how these matters have influenced the durations of the examples in my performances. My aim was not to compare the durations when I played these examples. I recorded each example three or four times. The purpose was to guarantee that I would have at least one version of each example with normal recording quality, and with the pedalling effects intended by Liszt. For further analysis I chose one version of each example. Thus, I could not draw any statistical conclusions about the length of the examples played on different pianos. Nevertheless, I detected some tendencies in my playing tempi.

The compared fragments were taken from Liszt's works *Marche funèbre* (Ex. 6.1), *Trauergondel II* (Ex. 7.1), *Wiegenlied* (Ex. 6.2) and *Aux cypresses de la Villa d'Este I* (Ex. 6.3). The results of the analysis of the durations

were unexpected. At the beginning of this section I assumed that the durations of the examples played on the Steinway would be longer than those played on the Chickering. In the case of three examples the comparison data did not support this assumption. Only in *Marche funèbre* is the duration longer. There is a logical explanation for this. Bar 28 of *Marche funèbre* is the only example where the tones played are located in the low register of the piano, and in this example the produced sound is more confused than in the other three examples. To achieve a clearer sound in bar 28 on a modern piano one needs to use a slower tempo. The loudness of each successive tone has therefore more time to decrease. I conclude that the tempo adjustments I made – without being aware of it – seem only to have served the purpose of minimizing the blurred sound. (The durations of the examples are presented in Table 7.1).

In addition to my performing tempos on different pianos, I also compared the durations of the examples played on the Steinway, using different degrees of pedal depression. In Chapter 7.5 it will be noted that the use of a partially depressed pedal, meaning that the dampers are close to the strings, in some cases accelerates the decrease in loudness when compared to using the fully depressed pedal. Therefore it would be logical to assume that in an example with a long pedal one needs to play the successive tones faster when using 1/6 pedal than in the case of a fully depressed pedal, because of the faster sound decrease. While using a fully depressed pedal, the player is in no hurry to get from one tone or chord to the next.

I played the examples on a modern Steinway using full pedal, 1/2 pedal, 1/4 pedal and 1/6 pedal. When comparing the durations of the played examples, presented in the Table 7.1, some connections between the degree of pedal depression and the tempo of the performance can be detected. In these examples I noticed the tendency to perform them slightly faster when the pedal was less depressed (1/6 pedal). As I expected, the biggest difference appears in *Marche funèbre*, the most problematic example, because of the low register involved. Using the full pedal I played this example in 2.230 milliseconds (2,23 seconds), whereas using the 1/6 pedal I played it in 1.770 ms, which is 460 ms (20%) faster.

In Table 7.1 I present the durations of all examples played both on the Chickering and on the Steinway, using full pedal, 1/2 pedal, 1/4 pedal and 1/6 pedal. Not all of the examples manifest a correlation between the degree of pedal depression and the tempo. For instance, I played the beginning of

Wiegenlied, using the full pedal, 90 ms (less than 2%) faster than using a 1/2 pedal. On the other hand, in this example there was no need to minimize the blurred sound. The texture occurs in the middle register (one-line octave) and consists of only two pitches (tones). Although this table is not based on statistical analysis, most of the data suggests that the choice of slower tempi correlates with the greater degree of pedal depression in the played examples.

Example	**Ch. 1**	**St. 1**	**St. 1/2**	**St. 1/4**	**St. 1/6**
Marche funèbre	2.050	2.230	1.920	1.520	1.770
Trauergondel II	11.320	10.750	10.040	9.560	10.620
Wiegenlied	6.030	5.180	5.270	5.180	5.120
Aux cyprès de la Villa d'Este I	3.860	3.600	3.510	3.000	3.250

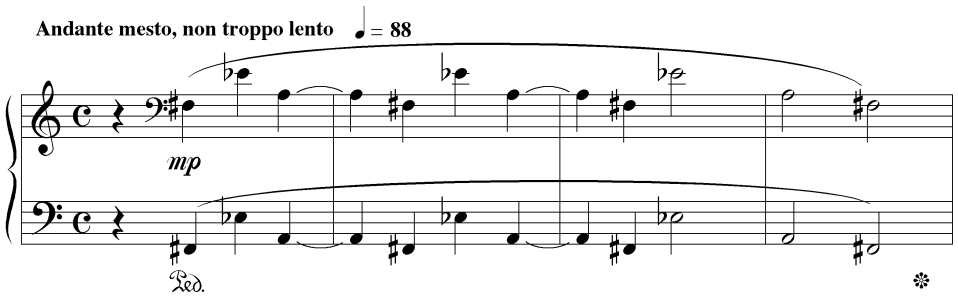
Table 7.1 Duration (in milliseconds) of examples played on the Chickering and on the Steinway with different degrees of pedal depression. (Ch.1-full pedal, St. 1/2- half pedal etc.).

7.4 ADJUSTMENTS IN DYNAMICS

In addition to variations in tempo I also detected some adjustments of dynamics in the playing of the examples. This is most obvious in the four initial bars of *Trauergondel II* (Example 7.1). Here a motive consisting of three tones (in octave duplication) is repeated three times with a sustained pedal. The phrase begins with the lowest of the three tones, followed by the highest one.

Figure 7.1 shows that on the Chickering I played all of the tones (F sharp, E flat and A) with similar loudness. When I recorded these bars a couple of months later on a modern Steinway my intention was not to make any changes in dynamics. Nevertheless, when using the modern piano I have given more weight to the E flats, without being aware of it. We know that the lower tones of the piano survive longer than the higher tones, especially on a Steinway. If I had played the second tone (E flat) with the same loudness as

the first tone (F sharp), its acoustical properties could not be recognized as clearly from the Steinway performance as from the Chickering one, the reason being that at the moment the second tone would have been played the first tone would still have sounded quite strongly. I thus made instinctive adjustments in dynamics in order to avoid a blurred sound.



Example 7.1 The beginning of *Trauergondel II*.

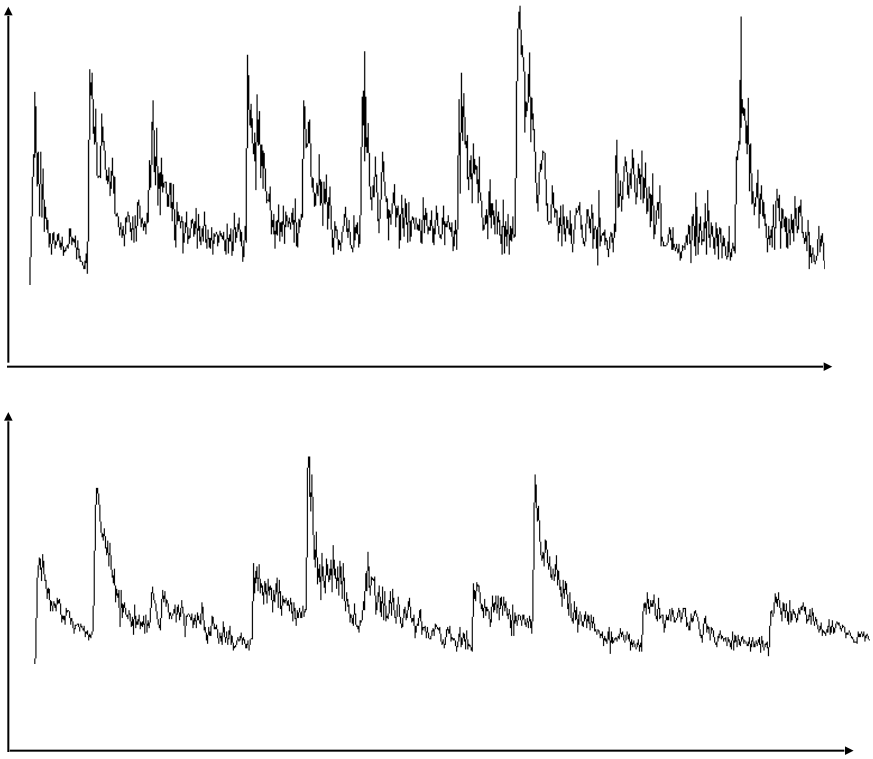


Figure 7.1 The envelope of *Trauergondel II* by Liszt played a) on Chickering, b) on Steinway

When using the long pedal and trying to achieve the clarity of the historical piano on a Steinway, the player might also make adjustments both in tempo and in dynamics simultaneously. The solution depends on the situation, for instance when the composer has written a *diminuendo*-indication into a phrase including a long pedal, the pianist cannot minimize the blurred sound by playing each tone louder than the previous one. The only solution would be adjusting the tempo. In the opposite case, where the character of the music requires keeping the tempo steady, the performer must not prolong the duration of a tone or tones, but he can adjust the nuances of the dynamics, unless this conflicts with the score.

7.5 REGULATION OF THE TEMPO

As was seen in Section 7.4, I unintentionally attempted to achieve the desired clarity of sound on the modern instrument by agogic means in those parts of *Marche funébre* that included problematic pedal effects. I believe that this tendency can also be detected in the performances of other experienced pianists. On the other hand, I can't see any reason why a pianist might not also regulate the tempo intentionally. While learning to play the piano the student or other less experienced pianist would, with the help of a teacher, consciously try to find the appropriate tempo, which would then help to find the desired sound. Even an experienced pianist should take into consideration all possible adjustments of rhythm or tempo in order to minimize the blurring of sound while working on a piece which includes problematic pedal indications. If these decisions are made during the learning process, they need not be concentrated on during the performance.

The performer always has to pay attention to the acoustical properties of the room. He has to listen to the sounding result of his playing and, if necessary, change the durations of tones or tempo of the performance if the character of the music allows it. This is accepted performance practice. It is difficult to see why this would not be acceptable in realizing Liszt's pedal effects. For instance, one possible way to achieve a similar sound envelope on the modern piano as on an instrument of Liszt's time would be to play the work, or a part of it, in a somewhat slower tempo.

However, the decision to change the tempo in order to realize the pedal effect with the clarity of the sound is always a compromise. When a slower tempo is chosen with the purpose of achieving the same effect as on an old piano, the danger may arise that in some cases the slower performance will destroy its rhythmic tension. I played bar 28 of *Marche funèbre* slower on the Steinway than on the Chickering, as was seen in Chapter 7.4. Nevertheless, *Marche funèbre* is, in my opinion, an example of a piece in which the player has to be very careful not to choose too slow a tempo. Although in bars 10-13 (Example 3.7) a slower tempo can decrease the blurring of the sound on a modern piano, it may also make the piece lose its martial character. One should not forget that once the tempo is chosen, the performer should keep it until the end of the piece. In *Marche funèbre*, for instance, the last page will become quite static if the tempo is too slow.

The adjustment of tempo will mostly help the pianist to achieve the desired clarity of sound when the texture lies in a critical area of the instrument, especially in the low register. The slower tempo may help us better recognize the sound properties of each tone (pitch, moment attack, loudness). In Chapter 6.5 I remarked that in some cases (in the middle register) the use of a long pedal will not necessarily result in blurred sound, but it will destroy the impression of linearity in the melody. When many successive tones of the melody are played with a depressed pedal, we do not perceive it as a melody line, but as simultaneously sounding tones, played at different moments. In my opinion choosing a slower tempo will not eliminate this phenomenon. In Chapter 5.2 we have seen that on a Steinway the loudness of a single tone decreases very slowly.[5] Thus, if we wanted to achieve a similar linearity of melody on a Steinway as on a Chickering, we would have to play the same melody many times slower. I do not believe that this solution could be used in any of Liszt's works.

7.6 MANIPULATING THE DYNAMICS

It was reported in Chapter 7.4 that I instinctively adjusted the dynamics in order to minimize the blurred sound caused by a long pedal. The envelope of *Trauergondel II* showed that on the modern piano I played the lower tones

[5] In Chapter 5 we have seen that, depending on the register, the loudness of a Chickering tone can decrease even three times faster than the loudness of a Steinway tone.

of the phrase more quietly than the higher tones. When a player tries to minimize the blurred sound effect, he may manipulate the dynamics, as well as the tempo, consciously or instinctively. He can vary the level of the envelope at the moment of the attack transient with his chosen dynamics. By manipulating the dynamics he will also modify the envelope's profile during the moment when one tone follows another. If a long pedal is used a tone will continue sounding even after the next tone is played, but the loudness of the first tone will have decreased to a certain level by the time the second tone is played. To minimize the blurred sound it is necessary to create sufficient difference between the level of loudness at the maximum point of attack transient of the new tone and the level of loudness at the point just before this tone is played. This can be done by playing the second tone slightly later, as I suggested in the previous section, because then the sound of the previous tone will have had more time to decrease. Another way to increase this difference of loudness could be to play every tone about as loud or louder than its predecessor. In the latter case the player naturally cannot continue this endlessly.

The situation becomes problematic if the loudness of a tone has not decreased sufficiently before the following tone. This may happen for two reasons: either the time between the two tones is too short, or at least the first of the tones is located in the low register. Bar 28 of *Marche funèbre* (Example 6.1) illustrates the latter case. The first tone of the measure could be played as quietly as possible, and each following tone always slightly louder than the previous one. In Figure 6.1 it is possible to see that the attack transient of the second tone of this bar can be detected without problems. The time between the two first tones is relatively long, and the volume of the first tone decreases enough before the second one has to be played. Thus, there is no need to play the second tone louder than the first one. The following eight-notes require a small *crescendo* for the attack transient of each tone to come out better. This is necessary in order to achieve a clearer sound in the case of this example.

As I pointed out before, it is not always possible to keep increasing the loudness where long pedals are marked in the score. Bars 10-13 of *Marche funèbre* (Example 3.7) serve as an example of this type of situation. The phrase is marked *forte* and the pedal has to be sustained for quite a long time. Nevertheless, regulating the dynamics is also one possible solution for trying to avoid a blurred sound. The dotted rhythm and the *forte*-indication could be understood to mean that every note of the phrase should be marked

with an accent, but accenting every tone of this phrase would not make the sound clearer. In this example the same figure is repeated several times and Liszt has drawn a *legato*-tie over the left-hand line. Liszt's purpose might have been to imitate a kind of wave-like movement. So as to perceive the shape of this left hand melody clearly it is important to bring out the top (A flat) and bottom (E) tones - or rather, these tones need not necessarily be played louder, but the other two tones (F sharp and G) can be played more softly.

Bars 35-39 of the *Dante Sonata* (Example 3.4) are another example of a long pedal marking where I would not use a continual *crescendo*. The beginning of the example is marked to be played softly and bars 38-39 have a *crescendo*, written by Liszt. According to the score, making a crescendo from bar 35 is not directly prohibited. If the performer, in order to minimize the blurred sound, already begins the *crescendo* in bar 35, the *crescendo* written into bar 38 will probably not create the effect desired by the composer.

It can be concluded that in realizing long pedal effects on the modern piano, careful regulation of the minute details of dynamics may, in many cases, help to make the sound more clear. In trying to achieve this it is, in my opinion, more effective to play short and low-register tones softer than high tones and tones following short tones. The blurred sound caused by the long pedal can also be reduced by adjusting the vertical balance of the loudness of the tones. In Chapter 5.2 we saw that the loudness of higher tones decreases faster than the loudness of lower ones. In the case of the octave passage, which we find in both examples of *Marche funèbre*, dropping the volume of the lower voice helps to achieve better clarity of sound. If the lower tone of the octave is played slightly more softly, without changing the loudness of the higher octave tone, the intensity of the sound and the character of the music will still survive.

7.7 PARTIALLY DEPRESSED PEDAL

In this study the analysis of the influence of a partially depressed pedal on sound properties presents two different results. These results seem to be slightly in conflict with each other. The effects of partial pedalling on the sound properties of a single tone and of several simultaneously sounding

tones differ from each other. The partially depressed pedal hardly changes the shape of the envelope of a single tone played on a modern piano (as presented in the discussion in Chapter 5.3). In Chapter 6 we saw that the partially depressed pedal made the sound of the Steinway clearer, as compared to a full pedal - in other words the transparency of the sound came closer to the sound of the Chickering. The data presented in Table 7.1 of Chapter 7.4 also seems to support this. In my opinion the less blurred sound, created by the partially depressed pedal, produced an acoustical condition which made me instinctively choose a faster tempo. When observing the envelopes' profiles presented in Chapter 6, we only find the effect of the partially depressed pedal in some of the examples. The influence of partial pedalling is especially noticeable in the examples set in the low register, for instance in bar 28 of *Marche funèbre* (Example 6.1, Figure 6.1). Achieving a certain level of sound clarity does not present such remarkable problems in the middle and high register of the piano that playing with a partially depressed pedal would necessarily be needed.

A pianist needs to study the interaction between the pedal and the dampers of the modern instrument. More precisely, he has to be aware of how low the pedal must be pushed for the strings to begin to vibrate freely, and in the opposite direction: how high he can let the pedal rise before the dampers will touch the strings. The performer has to be careful not to let the dampers fall onto the strings too early, either by accident or otherwise. A delicate control of the pedal is required.

As I pointed out earlier, the situation is most problematic when the composer has requested the use of a long pedal for a texture written in the low register. On that occasion all possible solutions for avoiding a blurred sound, including the partially depressed pedal, should be considered. Besides, in the low register the risk of accidentally breaking the vibration of the bass strings is not too great. Piano strings are much more massive in the bass than in the higher registers, and more than just a very soft touch of a damper is needed to stop the vibration.

7.8 CONCLUSION

The sound qualities of historical and modern pianos differ from each other. It is impossible to imitate perfectly the sound of an old instrument while

playing on a modern one, and one cannot create the same kind of clarity on a modern instrument as on a piano from Liszt's time. The player needs to find a way to minimize the confusion of sound caused by long pedalling. One perfect solution for all occasions does not exist.

The sound properties of a single tone as well as of some examples from Liszt's piano works have been analysed in this study. In order to determine the sound differences between the modern piano and the instruments of Liszt's time, it has been important to study differences between single tones. This study also concerned the influence of the pedal on the properties of piano sound. The analysis produced interesting results. Surprisingly, it showed that the use of pedal didn't seem to influence a single tone's loudness. As opposed to the case of a single tone, the pedal increased the loudness in some examples that included a long pedal. In the case of partial pedalling, dissimilarities can also be found between single tones and longer examples. The partially depressed pedal did not influence the loudness of a single tone (in this case, the middle c). When the characteristics of the envelopes of a single tone played with and without pedal are similar, it is logical that the partially depressed pedal does not have a remarkable influence on the characteristics of the envelope.

The partially depressed pedal only has some effect on reducing a confused sound if the dampers have fallen so close to the strings that they limit the amplitude of vibrating. This situation can be observed almost as a release of the pedal. However, the partially depressed pedal doesn't have an influence on the decrease of the tone's loudness in all the examples treated in the present study. In the beginning of *Wiegenlied* (Example 6.2) a passage of single tones is played within one depressed pedal. The texture of this example is similar to the situation of a single tone. Therefore, since a partially or fully depressed pedal did not have an effect on the envelope, we would not expect the partially depressed pedal to have any remarkable influence on the decreasing speed of the single tones in the beginning of *Wiegenlied*. Even if this example were played without pedal (which would be in conflict with the score), it would not remarkably change the envelope's profile.

The results of my study indicate that three possible solutions exist for the problem of clearing up the sound caused by long pedalling on the modern piano: a partially depressed pedal, adjustment of the tempo and adjustment of the dynamics. It depends on the situation which one should be chosen and

to what degree it can be used. A professional pianist uses many different pianos in different spaces and rooms. It is impossible to give exact instructions for each pedalling effect. Sometimes all three solutions may and can be used simultaneously. In the low register, for example, it may be best to use the partially depressed pedal and to vary the tempo as well as the loudness simultaneously, in order to minimize the blurring of the sound.

The artist needs to adopt an artistic and creative relationship to pedalling, if he wants to follow the composer's pedal instructions faithfully. Artistry, in this context, means reacting to the acoustical properties of the room, to the condition of the instrument and to the inspired impulses which rise up in the performer's own mind. The most important task contained in the interpretation of these pedal effects of Liszt is to find the balance between an artistically satisfying performance and the realization of the markings indicated in the score. The instruction given by Liszt for the beginning of his piano transcription of Wagner's Tannhäuser Overture should be applied to the pedalling effects written by him, as well:

> "Judicious use of the pedal is the general rule." (Rowland 1993:125)

APPENDIX I

TABLE OF PITCH NAMES AND THEIR FREQUENCIES

Today in Western music practice there are many different systems of note names in use depending on the tradition of each country. This study uses the so-called American octaves- and note names. To avoid any misunderstanding the rounded frequencies of every note name are added to the tones. In the following table the tones of the complete octaves of the full modern keyboard are shown. Regarding the latter, the octave names are written in bold print.

Contra	**Great**	**Small**	**One-line**	**Two-line**	**Three-line**	**Four-line**
C1 (33 Hz)	C2 (65 Hz)	C3 (131 Hz)	c^1 (262 Hz)	c^2 (523 Hz)	c^3 (1047 Hz)	c^4 (2093 Hz)
$C^{\#}1$ (35 Hz)	$C^{\#}2$ (69 Hz)	$C^{\#}3$ (139 Hz)	$c^{\#1}$ (277 Hz)	$c^{\#2}$ (554 Hz)	$c^{\#3}$ (1109 Hz)	$c^{\#4}$ (2217 Hz)
D1 (37 Hz)	D2 (73 Hz)	D3 (147 Hz)	d^1 (294 Hz)	d^2 (587 Hz)	d^3 (1175 Hz)	d^4 (2349 Hz)
$D^{\#}1$ (39 Hz)	$D^{\#}2$ (78 Hz)	$D^{\#}3$ (156 Hz)	$d^{\#1}$ (311 Hz)	$d^{\#2}$ (622 Hz)	$d^{\#3}$ (1245 Hz)	$d^{\#4}$ (2489 Hz)
E1 (41 Hz)	E2 (82 Hz)	E3 (165 Hz)	e^1 (330 Hz)	e^2 (659 Hz)	e^3 (1319 Hz)	e^4 (2637 Hz)
F1 (44 Hz)	F2 (87 Hz)	F3 (175 Hz)	f^1 (349 Hz)	f^2 (698 Hz)	f^3 (1397 Hz)	f^4 (2794 Hz)
$F^{\#}1$ (46 Hz)	$F^{\#}2$ (92 Hz)	$F^{\#}3$ (185 Hz)	$f^{\#1}$ (370 Hz)	$f^{\#2}$ (740 Hz)	$f^{\#3}$ (1480 Hz)	$f^{\#4}$ (2960 Hz)
G1 (49 Hz)	G2 (98 Hz)	G3 (196 Hz)	g^1 (392 Hz)	g^2 (784 Hz)	g^3 (1568 Hz)	g^4 (3136 Hz)
$G^{\#}1$ (52 Hz)	$G^{\#}2$ (104 Hz)	$G^{\#}3$ (208 Hz)	$g^{\#1}$ (415 Hz)	$g^{\#2}$ (831 Hz)	$g^{\#3}$ (1662 Hz)	$g^{\#4}$ (3322 Hz)
A1 (55 Hz)	A2 (110 Hz)	A3 (220 Hz)	a^1 (440 Hz)	a^2 (880 Hz)	a^3 (1760 Hz)	a^4 (3520 Hz)
$A^{\#}1$ (58 Hz)	$A^{\#}2$ (117 Hz)	$A^{\#}3$ (233 Hz)	$a^{\#1}$ (466 Hz)	$a^{\#2}$ (932 Hz)	$a^{\#3}$ (1865 Hz)	$a^{\#4}$ (3729 Hz)
B1 (62 Hz)	B2 (123 Hz)	B3 (247 Hz)	b^1 (494 Hz)	b^2 (988 Hz)	b^3 (1976 Hz)	b^4 (3951 Hz)

APPENDIX II

FRANZ LISZT PIANO PIECES 1869-1886

Franz Liszt's late piano pieces, written after the year 1868, are listed in chronological order. The works of each year are in alphabetical order. The sources for the list are *Franz Liszt und seine Zeit* by Wolfgang Dömling (see references), *Franz Liszt* by Peter Raabe, *The Catalogue of Liszt's Works* by Humphrey Searle and The catalogue of the *New Liszt Edition*. Each work of this list is followed by the date of composition and the catalogue number of Searle [S.] and Raabe [R.]. In some publications, instead of the abbreviation [S], [G] refers to the catalogue of *The Grove Dictionary of Music and Musicians*, because H. Searle prepared his catalogue especially for the Fifth Edition of this dictionary. The notes regarding the first publication and the location of the autograph are presented, if this information is available. In brackets is the number of pedal signs in the works written by Liszt himself. The piano pieces *Mosonyis Grabgeleit* (1870) and *Dem Andenken Petöfi* (1877) with some improvements are included in the series *Historische ungarische Bildnisse* (1885) by the author himself.

Ave Maria (aus den neuen Kirchenchorgesängen) 1869 (S.504) (R.193) –

C. F. Kahnt Verlag, Leipzig 1873. — [72]

Un portait en musique. La Marquise de Blocqueville 1869 (S.190) (R.65) –

"Le Figaro", Paris1889. O Musée d'Eckmühl, Auxerre. [0]

Mosonyis Grabgeleit 1870 (S.194) (R.110) –

Taborszky & Parsch, Budapest 1871. [69]

Ungarischer Geschwindmarsch 1870 (S.233) (R.56) –

Schindler Verlag, Preussburger 1871.	Széhényi National Library, Budapest.	[41]

Epithalam 1872 (S.526) (R.189)–

Taborszky & Parsch, Budapest 1872.	—	[51]

Impromptu 1872 (S.191) (R.59) –

Breitkopf & Härtel, Leipzig 1877.	The Library of Congress, Washington D.C.	[64]

Fünf ungarische Volkslieder 1873 (S.245) (R.108) –

Taborszky & Parsch, Budapest 1873.	Private collection of David and Orioli, London.	[40]

Elegie I 1874 (S.196) (R.76)–

C. F. Kahnt Verlag, Leipzig 1875.	Die Bibliothek der Gesellschaft der Musikfreunde in Wien (piano duet version).	[92]

Weihnachtsbaum 1874–1876 (S.186) (R.71) –

1. *Psallite*
2. *O heilige Nacht*
3. *Die Hirten an der Krippe*
4. *Adeste fideles*
5. *Scherzoso*
6. *Carillon*
7. *Schlummerlied*
8. *Altes provenzalisches Weinachtslied*
9. *Abendglocken*
10. *Ehemahls*
11. *Ungarisch*
12. *Polnisch*

Fürstner-Ausgabe, Berlin 1882.	The Library of Congress, Washington D.C.; Sotheby's catalogue, London.	[321]

Années de pèlerinage III 1877 (S.163) (R.10e) –

1. *Angelus (1877)*
2. *Aux cyprès de la Villa d'Este, Thrénodie I* (1877)
3. *Aux cyprès de la Villa d'Este, Thrénodie II* (1877)
4. *Les jeux d'eau à la Villa d'Este* (1877)
5. *Sunt lacrymae rerum* (1872)
6. *Marche funèbre* (1867)
7. *Sursum corda* (1877)

B. Schotts Söhne, Mainz 1883.	The Library of Congress, Washington D.C.; The British Museum, London; Goethe and Schiller Archives, Weimar.	[679]

Den Andenken Petöfi 1877 (S.195) (R.111) –

Taborszky & Parsch, Budapest 1877.	—	[59]

Elegie II 1877 (S.197) (R.77) –

C. F: Kahnt Verlag, Leipzig 1878.	Goethe uand Schiller Archives,Weimar.	[70]

Recueillement 1877 (S.204) (R.86) –

in Pel Monumento a V. Bellini, Neapol 1884.	—	[24]

Resignazione 1877 (S.187a) (R.388) –

"Franz Liszt" by A. Göllerich, 1908	The Library of Congress, Washington D.C.	[0]

Sancta Dorothea 1877 (S.187) (R.73) –

Gesamtausgabe der Franz-Liszt-Stiftung, Breitkopf & Härtel, Leipzig 1927.	August Göllerich collection.	[27]

Fünf Klavierstücke 1865–1879 (S.192) (R.60) –

1. 1867
2. 1865

3. 1873
4. 1876
5. *Sospiri!* 1879

Gesamtausgabe der Franz-Liszt-Stiftung, Breitkopf & Härtel, Leipzig 1928.	The Library of Congress, Washington D.C.	[97]

Choräle (Zwölf alte geistliche Weisen) 1878-1879 (S.50) (R.72) –

1. *Crux ave benedicta*
2. *Jesu Christe*
3. *Meine Seel' erhebt*
4. *Nun danket alle Gott!*
5. *Nun ruhen alle Wälder*
6. *O Haupt voll Blut und Wunder*
7. *O Lamm Gottes!*
8. *O Traurichkeit*
9. *Vexilla Regis*
10. *Was Gott tut, das ist wohlgetan*
11. *Wer nur der lieben Gott läßt walten*

Gesamtausgabe der Franz-Liszt-Stiftung, Breitkopf & Härtel, Leipzig.	Goethe and Schiller Archives, Weimar; Stargardt auction catalogue, Marburg.	[12]

Sarabande und Chaconne aus dem Singspiel "Almira" von Georg Friedrich Händel 1879 (S.181) (R.25) –

Kistner Verlag, Leipzig 1880.	Goethe and Schiller Archives, Weimar.	[154]

In festo transfigurationis Domini nostri Jesu Christi 1880 (S.188) (R.74) –

Gesamtausgabe der Franz-Liszt-Stiftung, Breitkopf & Härtel, Leipzig 1929.	Goethe and Schiller Archives, Weimar.	[34]

Romance oubliée 1880 (S.527) (R.66b) –

A. Simon Ausgabe, Hannover 1881.	The Library of Congress, Washington D.C.	[17]

Carrousel de Madame P[elet] *N*[arbonne] ca.1875-1881 (S.214a) (R.60b) –

New Edition of the Complete Works, Kassel and Budapest 1970.	The Library of Congress, Washington D.C.	[0]

Toccata ca.1875-1881 (S.197a) (R.60) –

New Edition of the Complete Works, Kassel and Budapest 1970.	The Library of Congress, Washington D.C.	[9]

Unstern. Sinistre. Disastro. (1880?) (S.208) (R.80) –

Gesamtausgabe der Franz-Liszt-Stiftung Breitkopf & Härtel, Leipzig 1927.	August Göllerich collection.	[11]

Ave Maria 1881 (S.545) (R.194) –

Liszt Society Publication, London 1958.	The Széchényi National Library, Budapest.	[6]

Czárdás macabre 1881 (S.224) (R.46) –

Liszt Society Publication, London 1954.	The British Library, London.	[66]

Trübe Wolken 1881 (S.199) (R.78) –

Gesamtausgabe der Franz-Liszt-Stiftung, Breitkopf & Härtel, Leipzig 1927.	Goethe and Schiller Archives, Weimar.	[8]

Valse oubliée I 1881 (S.215) (R.37) –

Bote & G. Bock, Berlin 1881.	The Library of Congress, Washington D.C.	[27]

Wiegenlied 1881 (S.198) (R.58) –

Liszt Society Publication, London 1958.	Die Musiksammlung der Österreichischen Nationalbibliothek, Wien.	[29]

Trauer-Gondel I 1882 (S.200) (R.81) –

Gesamtausgabe der Franz-Liszt-Stiftung, Breitkopf & Härtel, Leipzig 1927.	Goethe and Schiller Archives, Weimar.	[37]

Ungarische Rhapsodie XVI 1882 (S.244) (R.106) –

Taborszky & Parsch, Budapest 1882.	The Library of Congress, Washington D.C.	[61]

Ungarische Rhapsodie XVII 1882 (S.244) (R.106) –

Taborszky & Parsch, Budapest 1886.	—	[49]

Am Grabe Richard Wagners 1883 (S.202) (R.85) –

Liszt Society Publication, London.	The Pierpont Morgan Library, New York.	[14]

Bülow-Marsch 1883 (S.230) (R.52) –

Schlesinger Verlag, Berlin 1884.	Goethe and Schiller Archives, Weimar.	[52]

Dritter Mephisto-Walzer 1883 (S.216) (R.38) –

Fürstner-Ausgabe, Leipzig 1883.	Goethe und Schiller Archiv, Weimar.	[51]

Mephisto-Polka 1883 (S.217) (R.39) –

Fürstner-Ausgabe, Leipzig 1883.	Goethe und Schiller Archiv, Weimar.	[93]

R. W.- Venezia 1883 (S.201) (R.82) –

Gesamtausgabe der Franz-Liszt-Stiftung Breitkopf & Härtel, Leipzig 1927.	August Göllerich collection.	[2]

Schlaflos! Frage und Antwort 1883 (S.203) (R.79) –

Gesamtausgabe der Franz-Liszt-Stiftung Breitkopf & Härtel, Leipzig 1927.		[37]

Valse oubliée II 1883 (S.215) (R.37) –

Bote & G. Bock, Berlin 1884.	The Pierpont Morgan Library, New York (copy).	[75]

Valse oubliée III 1883 (S.215) (R.37) –

Bote & G. Bock, Berlin 1884.	Bibliothèque Nationale, Paris.	[68]

Czárdás 1884 (S.225) (R.45) –

Album du Gaulois, Paris 1885.	The Library of Congress, Washington D.C.	[38]

Abschied. Russisches Volkslied 1885 (S.251) (R.104) –

Fritzsch Verlag, Leipzig 1885.		[25]

Bagatelle ohne Tonart 1885 (S.216a) (R.60c) –

Editio Musica, Budapest 1956.	Goethe and Schiller Archives, Weimar.	[28]

En rêve 1885 (S.207) (R.87) –

E. Wetzler Verlag, Wien 1888.	—	[16]

Historische ungarische Bildnisse 1885 (S.205) (R.112) –

1. *Széchenyi István*
2. *Eötvös József*
3. *Vörösmarty Mihály*
4. *Teleki László*
5. *Deák Ferencz*
6. *Petöfi Sándor*
7. *Mosonyi Mihály*

"Új Zenei Szemle" ("New Music Review"), Budapest 1956.	Stargardt Antiquariat, Marburg.	[261]

Puszta-Wehmut 1885 (S.246) (R.113) –

Taborszky & Parsch, Budapest 1885.		[12]

Trauer-Gondel II 1885 (S.200) (R.81) –

Fritzsch-Verlag, Leipzig 1886.	—	[47]

Trauervorspiel und Trauermarsch 1885 (S.206) (R.83,84) –

Breitkopf & Härtel, Leipzig 1887.	Stargardt Antiquariat, Marburg.	[0]

Ungarische Rhapsodie XVIII 1885 (S.244) (R.106) –

Taborszky & Parsch, Budapest 1885.	Széchényi National Library, Budapest.	[28]

Ungarische Rhapsodie XIX 1885 (S.244) –

Taborszky & Parsch, Budapest 1886.	Széchényi National Library, Budapest.	[102]

Valse oubliée IV 1885 (S.215) (R.37) –

ed. Bryn Mawr, Pennsylvania 1954.	The Library of Congress, Washington D.C.	[27]

Vierter Mephisto-Walzer 1885 (S.696) (R.661) –

	Goethe and Schiller Archives, Weimar.	[26]

Czárdás obstiné 1886 (S.225) (R.45) –

Taborszky & Parsch, Budapest 1886.	Széchényi National Library, Budapest.	[71]

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