CHAPTER 2 MUSIC: THE ART OF TIME ALONE.

THE TEMPORAL ARTS IN GENERAL

Music is the art of time. In our experience of music hearing is essential sense. The other senses, in particular sight, function only peripherally. Through an examination of the differences between seeing and hearing, we will establish that while sight leads outwards to measurable quantities in space, hearing only leads inwards, into a world of qualities in time.

> DISTINGUISHING THE PHYSICAL CAUSE OF A SENSATION
>> FROM HOW IT APPEARS IN CONSCIOUSNESS

Our first step is to make a distinction between *sense data*, that which arrives physically from the outside world to our physical sense organs, and *perception*, that which goes on in consciousness after the brain receives the signals from these organs sent through the nervous system. The former we will term the *cause* and the latter the *effect* arising from that cause.

There is nothing *visual* about a light wave. There is nothing *audible* about a sound wave. These waves, by themselves, are nothing but a rearrangement in space of energy or molecules. If that arrangement, by an accident of space and time, happens to impinge on an eye or an ear, and data about that impact transmitted to the brain, only then, for the first time is there a *sight* or a *sound*. There was nothing foreseeable about this outcome. Only if it *does* happen, do we then trace that *effect* back to what we treat as a *cause* (the physical presence of waves in space). We then turn the procedure around and falsely impute to the cause an *inherent* ability to produce effect, the sight or sound, as if our conscious perception was already somehow contained in the physical waves. On this basis we call the wave the *cause* for the perception, and we even call the wave a *light wave* or *sound wave*, though light and sound are only known in consciousness. If we use the word cause at all, it would be more proper to say that the physical causality of sound is a *soundless* wave, and its effect in consciousness is a *waveless* sound.

Since, in this book, we have chosen to focus on our conscious experience of art in ascribing differences to the arts due to time and space, we have a right to ignore the cause in general. It is to the perception only that we turn for evidence of the role of space and time in music.

When we tell ourselves that space has an obvious role to play in music, it is because we are confusing the physical causality of the wave with the perception of sound in consciousness. While the physical cause for a sensation indeed lies in space, its effect in consciousness is of a radically different nature. We will examine in turn each claim common sense makes in favor of space playing a role in music, and show each time that the function of space is limited to the physical basis of the sense data, and *disappears* when the sense data eventuates in conscious perception.

The air, through which a "sound" wave travels, does not *hear* sound. It is merely having the arrangement of its molecules altered from moment to moment, some molecules drawing closer together, some farther apart. Even the ear itself does not *hear*. Only when things are no longer in the

form of waves or vibrations, after the vibrations have passed the outer ear, have been transferred mechanically through the middle ear, only after the pulsations in the liquid of the inner ear touch the nerve endings that line the cochlea, and the nerve's currents sent to the brain, that then, for the first time, we *hear*, and there is sound. If we examine the brain for this consciousness, we find only electrochemical discharges, we cannot find sound waves, we cannot observe sound happening anywhere. It is only consciousness that hears. Even the statement "consciousness hears sound" is misleading because it implies that sound was already present in some form, it being simply witnessed by consciousness. It is consciousness that creates sound.

By projecting the properties of the perception or effect back into the physical cause, we disguise and minimize the significance of their profound difference. We can recapture some of this lost significance through a thought experiment requiring a little creative rewiring of our nervous system. In the middle of our life, by a marvel of surgery, the nerve endings in the retina are disconnected from the optic nerve and attached instead to the auditory nerve. Henceforth when light impacts the eye, the nerve signals travel to the part of the brain that until then has received information from the ear. What will happen? It is quite possible that we will *hear* sight. If so, it would be inappropriate afterwards to call the physical wave coming from external space to the retina a *light* wave, we should call it a *sound* wave. If we did the reverse, and spliced the nerve endings in the inner ear into the optic nerve, we might well *see* a sound, and it would be no longer be appropriate to name the perception sound[1]. The purpose of this thought experiment is to introduce an element of philosophical *chance* into the change into the connection of cause to effect, a connection which is therefore not truly one of cause and effect, where the effect is inevitable given the cause. Thus while electromagnetic radiation, for example, is a physical fact, sight is an unpredictable miracle. Sight is not a light wave, it is not contained in a light wave, it is not foreseeable in the light wave.

Whereas a cause is always describable, a perceived effect is never. There is no way to explain what seeing *looks like* or what a sound *sounds like*. Sight cannot be described to a person who has *never* seen. At best we can say things about what it is *like* to see, or what it enables us to *do*. The other person, based on our description, can never *see* as a result, even in h'er imagination. What we take for granted is, philosophically, an unanticipatable miracle.

Our common sense procedure for describing what sight appears like in consciousness, is to describe the physical properties of electromagnetic radiation, and then letting the cause stand in as surrogate for the effect. We ignore that there might have been countless other modalities in which the result of these waves could have appeared in consciousness. We are no more able to imagine any one of these modalities than to imagine what a sense would be like that is not already one of the senses that we have.

That the conscious effect is not contained in the physical cause is demonstrated in the following two examples. Our eye is sensitive to electromagnetic radiation, but only within a narrow range of frequencies[2]. The retina simply does not respond to higher or lower frequencies. A simple turn of a knob on our part controlling the frequency of emitted radiation, and there is no longer any sight to see. A *quantitative* change in the cause results in the elimination of the *quality* of conscious perception. The cause meanwhile continues unabated. Philosophically all electromagnetic waves are "dark" and invisible unless "seen: with consciousness only there is 'light'.

Gradually lowering the frequency of electromagnetic radiation from violet at first causes change in color to blue, green, yellow, orange, then red, but after that color simply disappears entirely. There is no color after red. In its place, though, we aware of sensations of *heat* due to infrared radiation. Here, a *quantitative* change to the value of the wave's frequency is accompanied by a change from one form of sensation to a totally different one. There is no reason why vision could not have been created in such a way as to respond to a wider range of frequencies, so that infrared radiation would be seen rather than felt. But try to imagine what the color looks like. It is as possible as predicting consciousness itself. It is also worth noting that *within* the feeling of heat there is nothing to suggest that it is related to the experience of light.

A similar example is found in *sound* waves, which below a certain frequency are *felt* as *vibrations* and no longer heard as sound. The fact that we hear, and hear a (steady) pitch, means we do not perceive any separate vibrations, even though this separateness is inherent to the nature of the cause. There is nothing *within* the physical feeling of vibration that would suggest that it is related to the perception of sound, i.e. unless science steps in to inform us of the common material cause behind both experiences.

Nowhere is the unrelatedness of the physical cause to the modality of the conscious perception more apparent than with heat and cold. These are two *distinct* perceptions, each having their separate sense organs. Both respond however to the *same* physical causality: temperature, or the average velocity of molecules. The same temperature can produce at one time a feeling of cold and at another a feeling of heat. The room air in our house feels cold when stepping out of a hot shower, but at the same time feels warm walking in from the cold outside. These two effects can even occur at to the same person at the same time. If the right hand has been resting in cold water and the left in hot water, and then both are placed in lukewarm water, the right hand feels heat and the left hand feels cold. Here a change in sense occurs even when there is no measurable change in the cause.

Granted, without the presence of the cause in the external environment, the chain of physiological reactions ending in perception is not triggered. It is just that we cannot predict the nature of the effect from the cause. It is incorrect to attribute the *nature* of the effect to the cause: nothing we *see* looks *like* a wave. We cannot see a light wave when seeing light. We can only learn about light waves. No perception at all may result from a cause, as e.g. in the case of ultraviolet light. Or there can be different perceptions from the same cause, as with heat and cold. Given the cause, there is nothing inevitable about what the effect will be, or even that there should be such a thing as an effect. A rock subjected to pressure does not feel pressure. Here there is sense data available but no sense organs to even lead towards perception.

The profound difference between physical cause and conscious effect is apparent if we observe a nerve transmitting a sensory signal to the brain. From the signal alone we have no way of telling what sense is in the process of being transmitted. To know this we would have to trace the nerve to its extremities and see to what sense organ or to what part of the brain, it is attached.

Even the continuity of time in consciousness is an effect not supported by a cause. The nerves that transmit sense data to the brain do not fire continuously, but in discontinuously in chunks. From the point of view of consciousness however, sights and sounds are steady, neither consciousness nor

sights nor sounds "flicker". Given the difference with the cause, such continuity must lie within the nature of consciousness.
Common sense may respond at this point and counter that in one respect there is always a correlation between cause and effect: in their intensity. A brighter light is due to a greater amplitude in the light waves. A greater feeling of pressure is due to a greater number of pounds per square inch. As the intensity of the cause increases, the magnitude or intensity of the effect rises correspondingly. Bergson gave credit to this appearance of simultaneous variation in the cause and the effect for much of our belief that we can explain the effect from the cause. It is in fact, he says, our *subjective* appreciation of the difference in intensity in the *effect* that leads us to make conclusions about the difference in the magnitude of the *cause*. Consider heat and cold. Does not our subjective assessment of the intensity of heat *increase* when the temperature increases, but our subjective assessment of the intensity of cold *decrease* at the very same time?

While all the senses admit of impressions of intensity, and that there is measurable parameter in the cause that varies also in measurable amount, this is nothing predictable about what parameter that will be. It is only that there is *some* parameter of the cause that is linked to *some* parameter in the perception, both of which we would call intensity. An increase in loudness or brightness leads to pain. Other than that, there is no linkage between the two as perceptions, though both result from the same cause in the wave, its amplitude. Why, though, is it the wave's amplitude rather than its frequency that we respond to as a perception of loudness. Why could we not respond to a change in the frequency of a sound wave by our hearing a sound get louder and softer. For smell, the perception of intensity no longer has anything to do with the amplitude of a wave but with the number of molecules present per unit volume of air together with the inherent pungency of the molecule itself. For touch intensity correlates to the physical force, or pressure. Here the linking of the cause to the effect is abetted by the use of the same term for both, "pressure". At least with sound we use two different terms: amplitude and loudness.

We have adduced sufficient information at this point to conclude that conscious perception is profoundly different in nature from the physical causes that occasion it. That while science succeeds in describing the latter, the *how* of consciousness is beyond its grasp. While one may shrug their shoulders and wonder why the philosopher would be concerned with all of this, in particular given that conscious perception is the most obvious fact of our existence, we respond that it will help us understand that in music there is no space. We continue now to move in this direction.

> THE SENSE OF HEARING COMPARED WITH SIGHT

We examine the differences between sight and sound, with the aim of showing that while sight directly leads outwards to an awareness of space, sound leads inwards and is a quality that fills duration in time in our consciousness. If we can show that sight plays no role in music, we will have established that time rules undisturbed in music. A number of the temporal arts are borne aloft on the sense of hearing, but in music hearing functions alone.

The eye and ear are both physical structures in *space*. The eye contains a spatial structure called the retina, the ear a spatial structure called the eardrum. The retina responds in *different* places to light rays originating from *different* directions in space. The eardrum vibrates as a *whole*, regardless of the direction in space from which sound waves originate. The retina is a miniature model (minus

one dimension) of the space lying external to the body. The structure of the eardrum does not mimic the space in which sound waves arise. The spatial setup of the retina is preserved in the form of consciousness when we see. When the signals from the ear reach the brain, all traces of space[3] are lost in the conscious form of sounds. Electromagnetic vibration (light) and waves in matter (sound) tend to be emitted in all directions from their source. While the eye is designed to distinguish where a light source lies in external space, the ear is more indifferent to where a in space a sound originates. It may notice differences in the quality of the sound due to directional differences, but it does not know, on its own, how to apply these differences to an understanding of location in space.

As we change position relative to an object in space, it changes its appearance according to the laws of perspective. It disappears entirely if another object that is opaque interjects itself nearer to us. The nature of a sound does not change much with when we change our position relative to its source. We continue to hear a sound when coming from an invisible source around a corner or behind another object. We never call the differences we note in sounds differences in the *shape* of the sound.

When two objects form a visual relationship, the relative amount of area of the visual field occupied by each is an important factor. When two sounds for a relationship, that relationship has nothing to do with the areas occupied by the sound sources. If we move away from an object, the sight of it becomes both smaller and dimmer, a change in quantity and quality respectively. If we move away from a source of a sound it gets softer, an analogue to dimmer, but there is nothing regarding it about which we can say that it gets *smaller*. Sound as we perceive it does not occupy a position in space, an amount of space, or a position in space.

Sights block, sounds include. One sound does not prevent us from hearing another sound, even if their sources lie in the same direction. They do combine, but in a way that still allows us to perceive them separately. A nearer sight must be removed in order to see a farther sight. In fact we have come to rely on this simplification of content in the visual sphere resulting from opacity. It is hard to see the identity of objects when they are superimposed on each other in a double exposure photograph. Sight is prioritized by distance[4]. Only significantly louder sounds have a tendency to obscure significantly softer sounds, but even this is mitigated when the sounds have different pitches, durations or timbres. Sights exclude, sounds include.

With light, a change of frequency is noticed as a change in color. With hearing a change in frequency is noticed as a change in pitch. Pitch doesn't suggest color, in fact it is another quality of sound, timbre, that somewhat suggests color. While only a small percentage of the population has *absolute* pitch (the ability to identify the pitch of a note without needing to compare it with another note) most of the population has "absolute color": the ability to distinguish one color from another.

Colors side by side in space do not combine. Colors in the same space combine into a new color, whose creation erases any awareness of the previous colors that went into the combination. Tones that are sequential do not combine. Tones in a chord combine into a new sound, within which however we can still hear the original pitches. Colors next to each other intimate their combination without loosing their identities. Notes in a melody do combine into a noticeable harmonic aura but do not loose their identities.

The qualities of brightness and color, though inherently non-spatial, become automatically conjoined with space in the area in which they are observed, and the latter, the area, itself becomes a characteristic of what we see. There are thus three parameters to sight. Pitch, loudness and timbre are parameters of sound. They are never conjoined with anything of space, they are instead conjoined with the duration of the time in which we perceive them. Shape is a characteristic of a sight that is as much about space as it is about sight. Duration is a characteristic of sound that is as much about time as it is about sound. There is thus one more parameter to a sound than to a sight, which helps explain the richness and complexity of structures based on sound alone, even though they exist without the dimensionality of space.

So far we may conclude that space is immediately evoked by sight while it remains outside the perception of sound, which is thereby internal and temporal.

> SIGHT MAKES US AWARE OF OBJECTS

From a single source, light waves and sound waves emanate in all directions and are reflected off of material surfaces. There can one source of light, but our eyes will see a multitude of different objects that reflect the light to our eyes. When sound waves from a single source are reflected off of a plurality of surfaces, we are aware of only one sound, only the quality of the sound may vary from dry, to focused, to rich, to blurry, and then to echoic. Such differences would not occur for light. Sound waves propagate much more slowly than light waves, so that differences in the distances to reflective surfaces have a greater impact on when waves arrive at our ears.

Light thus has the salient property of making us directly aware of the existence of that off of which it reflects: objects. Sound at most gives us indirect hints about the nature or existence of the surfaces off of which it reflects. So while hearing only makes us aware of sounds, light makes us aware of light but also creates the perception of objects. Many of the contentions raised in favor of space playing a role in the experience of music are based on the role that physical objects play in music making, but hearing does not lead directly to the perception of objects. It is only through previous experience linking of what we hear to what we see, that makes us think that we *hear* objects, but this is in the nature of something intellectually added to the perception of the sound alone. If music is able to create a viable reality with sounds alone (we discuss this later in the chapter when dealing with the structure of music), then in this reality there are no objects (at least in any traditional sense). To know about the properties of the objects reflecting or emitting sound, we would have leave this reality for the everyday reality. We can take this a step further. If we have sufficient cause to stay within sounds alone, and sever thereby temporarily hearing's link with the other senses, there is nothing within sound itself that would lead us to suppose that there is even such a thing as space itself.

> IN THE DEEPEST EXPERIENCE OF MUSIC HEARING FUNCTIONS
>> WITHOUT SIGHT

Nothing about the beauty of music requires the addition of sight. There is nothing in the conscious apparel of sound that suggests the need of anything additional such as a cause that is of a nature than different what we are hearing. Being told that there is a cause to sound changes nothing in the

conscious form of the sound, or what we derive from it when appreciating the sound in itself. Sight may yield interest, but that interest is supplemental, most often adscititious. Thus it can be *interesting* to watch the musicians playing, but if we become too involved in *watching* them we in effect stop *hearing* the sounds as sounds. We start to believe that the sounds are aligned with the musicians' gestures and interpret what we hear in terms of the gestures we are seeing. This dilutes or subverts what the sounds are truly saying to us. Music has no need of help from outside sound, even if this additional information arises out of the very activities that produce, i.e. that are the *causes* of the sounds. Music can communicate an entire universe, never leaving the domain of sound.

I am walking along the seashore. I am captivated by the sounds of the waves. They enchant me. I attention focuses more and more on the sounds until it makes me forget everything else. I cease to be aware of the space around me, or that I am still walking in it. All that I am aware of as a sentient being is coming in through my ears: I am in a purely sonic realm. Though the sounds began as one part of a conjunction of senses in the everyday reality, they separated themselves off into a realm of sounds so complete that I have no memory of any other senses having previously claimed my attention. My world is complete as it is. What *was* a part has intensified into a whole. There has been no loss either, for sound, when the whole, reveals more to me than when it was just a part. Reality is as full as before; just a different reality than before. The nexus of the senses has been untied. As on the seashore this one time, so with music all the time. sound is a universe to itself.

The other senses do not add to this completeness, they detract from it. For if, while deeply in this state of just listening to the waves, my eyes chance to open, as I become aware again of the visual impressions of the waves, for some moments I have the strange feeling that the visual appearance of the waves is badly misaligned (out of tune) with what the sounds of the waves. The sights do not *fit* the sounds aesthetically. I am loathe to readmit the sights and be forced back into a realty in which I must accept the visual appearance as being part of or belonging to the aural experience I have just been having. What the waves look like is certainly not what I would have imagined a moment earlier if I were asked to create for myself a sight that meant to me what the sounds mean. What I now see fails to capture what I experienced in the sounds.

While I was rapt by the sounds, sights and sounds fell apart from each other. While in the everyday reality, it would have been enough that the sights and sounds both belonged to a common *object*: the wave. Once I have untied the senses I become a connoisseur of realities and refuse to take the everyday any longer for my common fare. I realize that both the word "wave" and the object "wave" have acted as a tyrant over me, forced me to acquiesce into the joining of a particular sight with *my* sound, because I was misled by the everyday reality into thinking they were irrevocably joined. From now on it will be *I* who have the right and the power to combine them again - if I choose. I have become an "artist".

The wonder I find in sounds by themselves, or could as easily find in sights by *themselves*, may be just what I experienced when I was newly born. If I could have reasoned back then, I might have said that it was a farfetched notion to forge links between those two senses in the future, especially when each remained dazzling only when left on their own. That wonder probably waned, and was replaced by the practical need to subordinate each of the senses to a larger, more practical whole. Henceforth I was deaf to the sounds and blind to the sights, and lived in a world where their combi-

nation yielded something quite different from any of them by themselves: i.e. objects. I began to forgot what the senses could do for me apart. At the same age I was developing a notion of myself as an ego, a separate existence that wanted to live forever but had to maintain guard for else it would die. An inner coordination into an inner reality was occurring in tandem with the outer joining of the senses. Then I became a teenage, and was born again. I rediscovered the dazzling of the senses through art. I *remembered* that the senses need not submerge their individual personalities in order to serve the *higher* purpose of a reality. There were other realities just as good, or better that allowed the senses to exist in purer forms. I was born again. The wonder of art, of nature, and girls in particular, reached in and worked a revolution that almost overthrew everyday reality, and at minimum changed it forever.

> IN MUSIC THERE ARE NO OBJECTS IN THE TRADITIONAL SENSE

I am sitting in a rural setting with my friend Annie who is helping me edit this chapter. I ask myself what am I hearing at the moment. I pause to examine how I am putting the words together to answer the question. I say "I hear the sound of water in a brook, the sound of cars passing by on the road nearby, and intermittently I hear the sound of birds". In each sentence I have coupled the word "sound" with the *name* of an object. I speak in terms of the sound *of* something. Even if I stop short of the name of the object, the words leading up it, "I hear *the* sound" already implies an object to complete it. Now I am back in my childhood bedroom in Brooklyn at night. As I lie in bed I say to myself "there is the sound of a Brighton Beach subway passing by five blocks away, there is the sound of the neighbor's dog down the block". "Now I hear Teresa fighting with her brother next door in their living room." I am somewhat comforted by knowing these identities. I would be more alarmed if I heard a sound I didn't recognize. The sound of an eerie monster from two years earlier becomes now, with more knowledge, the sound of the wind blowing through the cracks in my window. It is reassuring at night, in the dark, to know that there must be some specific cause for sensations, that it is *not* a disembodied sound.

It is only by linking a perceptual effect to a material cause that we can make statements such as "this is the sound of a car". All sounds were originally *new* sounds. The need to survive in the everyday reality required that we learn to trace sounds to the objects that give rise to them. That we can evaluate a potential for threat or promise, and to take action accordingly. When linked to objects, sounds are the means to their own eclipse into the shadow of an idea. When safety is not an issue, however, as when we are in a concert hall, then the need dissipates for finding out what objects give rise to a sounds. At most now it is a lingering intellectual curiosity. While listening to the symphony, hearing what a sound sounds *like* does not require that it be the sound *of* anything. All that I need to distinguish one sound from another are purely qualitative factors such as pitch, loudness, timbre and duration.

> HOW THE SOUND OF A BIRD LIVES IN TIME ALONE WITHOUT SPACE

Imagine a person born blind, living alone, out of touch with society, surviving through what sh'e can grasp with h'er hands. Sight has never had an influence on h'er notion of reality. From a hidden vantage point we notice that the subject hears the sound of a bird singing. Never having seen a bird, there are no past conjunctions of sight to sound to link the sound of the bird with the sight of a bird. There is only a certain quality of sound that is distinguishable from the qualities of other sounds s'he

has heard. If the question "why" arises around this sound, the question is left in the domain of time, it is phrased only in terms of "why do I hear that sound now".

At this moment, a miracle occurs. Our subject can see. One of the first things that happens is that s'he sees a bird. There is no reason yet to link the sound just heard to the image before h'er. A psychologist now enters the scene, introduces themselves, and presents h'er with a series of pictures of objects. She is asked to point to the picture of the object that occasions the bird's song. "Does a sound require an object in order to happen?" s'he asks. "Yes". She is surprised. So she looks for an image that somehow has a visual quality resembling the quality she attributes to the sound she knows. S'he picks the wrong picture[5]. It will take a number of visual observations of the bird before the everyday connection between the object and the sound can be made.

As with the psychologist's pictures, sights during a concert provide are added to the sounds from outside the sounds. For some visual impressions serve as a refuge when they cannot derive the full richness offered by the sounds alone. Otherwise if we close our eyes, we loose nothing of the performance, instead we gain the power of the sounds which now inhabit a self-sufficient universe. Only in the everyday reality, through cause and effect, are the musicians, for example, related to the sounds. The composer, however, has taken great pains to create a reality in which only sounds exist. The sounds serve no purpose beyond themselves such as to provide information about what we are seeing. People who have auditory illusions testify to just how "real" they seem. There is no difference from sounds from the everyday reality originating from external space. If, because of the music, we suspend our experience in the everyday reality, there is no longer anything to tell us if a sound arises externally or internally. The sounds simply live in our consciousness, in a world without objects, an internal world, in time alone. All that music ever requires of space is that there be a physical causality of sounds, and if we see the musicians playing we tolerate their presence in behalf of the cause.

> REMAINING ARGUMENTS IN FAVOR OF SPACE PLAYING A ROLE IN MUSIC

We wish to resolve some of the lingering doubts the reader may have regarding the exclusion of space from the experience of music. The basic principles discussed so far should dispel them. We present them in the form of arguments with responses.

> THE MUSICAL SCORE

Argument. The printed score, represents musical spatially, and defines what a piece of music is.

Response. The score *facilitates* learning a new piece but is not truly necessary. The notational system used for music is a spatialized metaphor for time. It is worth remembering from chapter one what Bergson on the subject of the difference between true time, in which music exists, and the intellect's notion of time, which is space masquerading as time. In scores of Western music sounds are represented by circles yet there is nothing about a sound that is "round". The most essential characteristic of a sound, that it endures through time until the next note, is left to the blank space in the score between the note circles. Fullness in time becomes emptiness in space. To become music, the score must be translated back into an experience in time.

Movement rightwards in the score implies time while vertical motion suggests something entirely different, a difference in pitch. If we were to believe the spatial properties of the score, succession in time occurs at "right angles" to pitch. More fundamentally, to say that time "moves" in any direction, is to create a spatial metaphor because time doesn't move. All directions in space are inherently equal, unless we step in from outside and arbitrarily define one direction as being primary. Direction in space is always arbitrary with regard to time.

Musical notation therefore can at most represent two variables of sound to any degree of precision. Pitch uses up one dimension yet still requires additional sharp and flat signs. Duration, which uses the other, is indicated as much by the shape of a note as by its position in space relative to other notes, so at best the spatial analogy is inexact. Loudness is given very little attention although it is one of the most important features in the crafting of the performance of a musical line. Subtle distinctions of loudness are left up to the performer and are left to the performer's "interpretation". Timbre is handled is handled as an extension of the dimension for pitch, by stacking different staves on top of another.

It is precisely because it is in space and not in time, that the notational system is useful to the composer. The composer can enter the symbols for sounds without having to wait for one sound to complete in time before entering the symbol for the next. Nor does s'he have to enter the symbols in the same order in time that they will occur in when performed.

> THAT SEVERAL OF THE BASIC QUALITIES OF SOUND ALREADY
>> CONTAIN WITHIN THEM SPATIAL ASPECTS

> PITCHES ARE "HIGH" OR "LOW"

Argument. Sounds have pitch, which we easily identify as being "high" or "low", terms which have no meaning without space. The musical score supports this interpretation.

Response. When I am giving a new student their first piano lesson, I usually play sounds with very low and very high frequencies and ask which sounds the student would describe as being "low" and which as being "high". The answers are generally the same but not always. Sometimes a student will label as "high" a sound with a low frequency, or a high frequency sound as "low". This suggests that there is not a *necessary* but only an *accustomed* correlation between frequency and high and low-ness. In the case of light, a change of frequency produces a result to which the notion of magnitude, let alone high or low, does not apply at all: i.e. a change color. Why should sound give us direct access to the cause and not light, when the cause for both are waves? We can compare the difference in pitch between one pair of sounds with the difference in pitch between another pair. We cannot do this with colors. A better analogy to color in the realm of sound is found in the aptly named parameter tone *color* or timbre. While the physical bases for color and pitch are similar but lead to subjectively very different effects, the physical bases for color and timbre are quite different, but lead to similar effects. Cause leads us to link one pair of parameters while effect leads us to link a different pair.

For a harpist, higher is as much nearer as it is higher, and low is as much farther as it is lower. If a piano were constructed in reverse, so that pitches became "higher" as they moved leftwards, the in-

strument would be no more difficult to play, although it would require a reeducation. If we did this, then the notational system might also have to be reversed so that pitches with higher frequencies appeared lower on the staff.

There still may be other reasons for our usual assignments of high and low to pitches. One possibility is our sense of the increasing muscle tension necessary for singing notes of "higher" pitches. This sense of the intensity in the muscles is however a subjective evaluation of magnitude of an inner kinesthetic sensation, and is therefore not quantifiable and not spatial.

Interpreting pitches as being "high" or "low" encourages the false notion that there is a measurable *distance* between them, and a common *unit* of measurement, usually the half step. In perception, different intervals have only different *flavors* or qualities of sound, but they are treated instead as if being bridged by a succession of implied, adjacent half steps, even though there is no awareness of these half steps within the effect of the two notes sounding together[6]. If we remain in the conscious effect, the relationship of two pitches is a relationship between two qualities of sounds: which is itself but a third quality.

> THE LOUDNESS OF A SOUND

Argument. Sounds have loudness, which varies innately in terms of greater and lesser, and which are therefore measurable

Response. Here is what Bergson says in general about the relationship of the magnitude in the cause versus the magnitude in the effect. "…The first", Bergson says, is "extensive and measurable, the second intensive and not admitting of measure, but of which it can nevertheless be said that it is greater or less than another intensity." "…whether we think of a greater intensity or a greater extensity, we experience in both cases an analogous impression; the terms 'greater' and 'less' call up in both cases the same idea." "…in the immense majority of cases, we decide about the intensity of the effect without ever knowing the nature of the cause, much less its magnitude: indeed, it is the very intensity of the effect which often leads us to venture an hypothesis as to the number and nature of the causes". "…the comparison of two intensities is usually made without the least appreciation of the number of causes, their mode of action or their extent." "When we assert that one number is greater than another number or one body greater than another body… we allude to unequal spaces… and we call that space the greater which contains the other. But how can a more intense sensation contain one of less intensity?"

Another aspect of loudness that would seem to have to do with space is that the nearer a constant source of sound is to us, the louder it is. However, there is no way of determining from just the sound whether it is loud because its source is near or because, though the source is further away, its amplitude is higher.

> DURATION HAS LENGTH

Argument. Sounds have durations, and durations have a magnitude that are measurable. Time has "length".

Response. Time that can be measured with a clock Bergson calls *ideal* time. It is the *t* in the physicist's equation. One can plug in any value for t in an equation at any time. It is like a LP recording where to get from one point in the piece to another, we can lift the tone arm into the third dimension and set it back down in a different location back in the second dimension. In contrast to ideal time, Bergson says there is *real* time: that which is experienced in consciousness as duration. In the analogy with the LP recording, it would be as if the only way to get from one place to another on the disk was to endure through all that transpires in between. Furthermore, because the turntable rotates in only one direction, we cannot reverse the process and go from point two back to point one. Reversibility is spatial notion only. Ideal time, Bergson says, is not really time at all, but time translated into space. It is the sweeping hand of the clock that marks off time through motion in space. We do have an internal sense of the magnitude of real time, but it lies in the consciousness of our own enduring through time. Our sense of the magnitude of the duration of a sound is very different than marking off the beginning and ending of a sound on a clock and measuring the difference.

> MUSICAL INSTRUMENTS

Argument. Without musical instruments, physical objects in space, there is no music.

Response. While the physical cause is a concern of the musicians while playing, it is absent to the consciousness of the experiencer.

We must *first* know its shape, in order to then imagine the image of the object violin when we hear it. This is simply another instance of the blind person from before, except we are substituting a violin for a bird. The consciousness of an object is the result of a process that, though beginning with sight and sound, eclipses both into the object. If we separate the sound of the violin from its visual appearance we think that we are doing something incorrect. We assume from the object that they are inseparable. If we suspend the process of forming an object-meaning (in the sense discussed in chapter one), there is no need to involve the musical instrument as an object in any way with our hearing of a sound. Without previous experience, nothing about the sound of an instrument suggests its form. Instruments of very different shape can produce similar sounds. Even from a purely physical point of view, it is not really a violin that we are hearing. Regardless of what object vibrates in the external environment, it is not that object's vibration that is sent to the inner ear, it is the vibration of the ear drum. We are always hearing just one object in vibration, the ear drum.

> THE EAR

Argument. The ear, a mechanical and physical structure in space, is required to hear sounds.

Response. We can hear without the ear at all simply by using our imagination. No physical cause is needed. The ear is basically a musical instrument, the ear drum is similar to any drum with a stretched membrane (except that we do not play it, but it vibrates in sympathy with the sound waves entering the ear). As with other cases of sense data versus conscious perception, the effect cannot exist without the cause, but the cause is not known in its form as a cause within the conscious form of the effect, it can only be derived rationally according to the principle that every effect must have a cause. There is simply nothing space-like about sound when it is in our consciousness.

> THE HUMAN VOICE

Argument. The first musical instrument was the human voice, and it is the prototype for all others, which are but the voice once removed in space. We live *within* this particular musical instrument. The vocal chords are muscles. Whenever we use our voice, we are experiencing more than sound, we are experiencing the movement of these muscles. We have a clear idea of the magnitude of their movement. There is thus a physical correlative to the sound that always accompanies the sound and which we cannot separate from it.

Response. This argument assumes that our experience of muscles in motion, including the sense we have of their magnitude, is an experience of the cause of the sound. In fact, it too is a perceived effect. Kinesthetic sensations are no different than other conscious perceptions arising out of sight or hearing, just that the data for these originates from the space within our body. We can measure with scientific instruments the contraction of a muscle, but that is very different from our subjective perception of the contraction of that muscle feels like, including the intensity within that feeling.

> MUSIC REQUIRES A PERFORMER

Argument. The performer, an entity in space is required in music making. The performer's movements in space are directly responsible for the sounds we hear.

Response. This much is simply another instance of cause versus effect. The cause must exist, but sounds can exist as sounds as if they had no cause. If we are listening to a live concert with our eyes closed, and then open them and see the musicians, we briefly experience an essential irrelevance of what we are seeing to what we are hearing.

Argument. If not as a necessary part of the sound, wouldn't an awareness of the musicians, especially their gestures and facial expressions, provide us with valuable insight into how we should interpret the sounds we hear?

Response. We are assuming that the musicians' gestures are an aesthetic "record" of the piece we hear, but they are not.

We are in a much better position to hear clearly if there is no distraction from the other senses. An irrelevant distraction, the odor of a perfume, the sight of a person walking down an aisle, is sufficient to ruin our concentration on the sounds. Our most concentrated awareness is poised at the living edge of the sounds, in the fragile present, where the past is about to connect with the future. We must remain connected in time with the sounds as they evolve. Information from another sense will lead our attention down a different path, even if it is a parallel path through time. Only when sounds are left alone to settle out in our consciousness, does the universe they create appear. Like the finely balanced environment of a cloud chamber that would record the passage of a tiny particle, we can only respond sensitively to music's reality when protected from outside influences including the sights of the musicians. The angular motions of the violin bows, the varied expressions on the musicians' faces, the gesticulations of the conductor; none are in aesthetic accord with the music as sound.

We may see a performer's gesture in space and impute the quality of that gesture into the quality of the sound, though it is not to be heard in the quality of the sound at all. As a pianist I am aware how easy it is to confuse one sense with another, for instance to think I am hearing a sound when I am actually *feeling* my finger depress a key. Similarly, we may think we are hearing something but in fact we are seeing something. Often we mistakenly derive our understanding of what we think we're *hearing* from what we are seeing. The exaggerated gestures of histrionic conductor or soloist gives us a visual interpretation of what s'he would *like* us to think we are hearing. It is a device to make us think they have achieved something in sound which in fact they did not. It turns the work of music into a theatre work whose gestures form a running commentary instructing us how the performer would wish us to respond, when often the power of the performance lacks the ability to elicit the feelings acted out in the gestures. The audience is often a willing participant in this hoax, welcoming any clue they can get regarding what they think they are supposed to be hearing or feeling in the music[7].

On the one hand we risk imputing into sound what we see with sight, while in fact sights prevent us from realizing the full effect of the sounds. It is hard to just listen, we feel more comfortable relating music to a sense with which we are more familiar, sight. The composer however strives to create an artistic environment in which sound is designed to stand alone. When the performance is bad, it may be a worthwhile diversion to watch the musicians at work. If it is a good performance, but we lack the required powers of aural concentration, we welcome "visual aids": simultaneous translations of sound into a language we better understand. When we come to the chapter on film we will study the situation in reverse and determine whether hearing the actors talk is a distraction from what we see when we watch the film.

> THE DIRECTION A SOUND COMES FROM IN SPACE

Argument. Sound already contains space because we can tell from just a sound from what direction it comes.

Response. Of all the arguments in favor of space playing a role in hearing and in music, this is the most compelling. Ultimately the issue boils down to whether, if we had no prior knowledge of space, the differences in sounds that we attribute to the source lying in a different direction, would be perceived by us as merely as being differences in the quality of the sound. That these qualitative differences, if and when applied to what we already know about space, then *become* directions.

Consider the difference between using one versus two ears. If I place myself near a source of a sound, then close one of my ears and rotate my body slowly, the sound changes in one regard only: its loudness. There is no indication of spatial direction. If I repeat this with both ears open, in addition to some changes in loudness, I am aware of something new that I wasn't before, something which I recognize as a change in the direction from the sound comes. Even with my eyes closed, I can point with impressive accuracy to a sound source. Maybe there is something we can learn through analogy by considering what the difference is in the appearance of sights when we use one eye versus two. Using two eyes allows the brain to interpret the slight difference between the images in each eye in order to provide us with something unobtainable with one eye: a sense of an object's depth and roundness. Two ears allows the brain to interpret the differences in loudness entering each ear in order to provide us with a sense of from what direction a sound comes. Two eyes

give me awareness of depth, two ears give me awareness of direction. The purposes seem quite different, but are they really? We have two eyes, but we have one image in consciousness. We have two ears, yet we hear one sound. If depth adds *roundness* to sights, could having two ears add something which, if there *were* space in hearing, we *would* call the depth or roundness of the sound, but which, without space, adds something purely qualitative to the sound, something akin to, if not exactly the same as, resonance? An out of alignment of images results in depth in one image, a different quality than the form of the cause. Similarly, we don't hear two sounds, one in each ear, that are somehow out of alignment. We hear one, which now contains a new quality that we normally link to direction in space.

In a typical hearing test, the tester asks a blindfolded subject to point to the direction from which a sound comes. Even with our eyes closed, we easily imagines how our body deports itself in space. Space is still actively present. Within our self, there is a clear difference between the *feeling* we have of right versus left. If, however, we analyze this feeling carefully, it contains nothing in itself that relates *yet* to space, it is just a feeling. It will *become* a direction when the feeling is joined by what we already know about space. Without space, the feeling would be purely internal and we would not yet give it the name "right", which only has meaning in space.

Is it possible to eliminate our awareness of space, once that awareness it is there? There is a somewhat familiar experience in which the quality of our sensations are severed the awareness of space that usually accompanies them. I'm lying in bed with my eyes shut. I become aware of the presence of my feet from inside: I feel them. As I become absorbed in that feeling I suddenly notice that I am no longer aware of *where* my feet are. I can't figure out where they lie relative to my torso. There is nothing in the feeling to give me information about their distance from me. I've somehow turned off my usual sense of how my body disports itself in space. For all I know my feet are a hundred feet away or not in space at all, that they are just feeling. Without a sense of space I cannot trace my awareness of myself from one point in space to another. Even my consciousness no longer seems to be *in* my head. It's just a presence. No particular part of space, seems to have any more claim than another as being the location of my consciousness. Without a location in my body it starts drifting towards the "Atman" of Hinduism. After I reactivate my spatial sense, I will know again how my body takes up space, and that my feet lie five feet from my head. However, I will have gained the knowledge of the difference between the awareness of the body as taking up space and how it does it,, and the affective sensations that I have of my body. Perhaps with hearing, it is only through experience that I have joined certain internal qualities about sound to my image of space; that direction is not an inherent quality of sound.

> MUSICAL STRUCTURE

Argument. We understand the relations between sounds better if we imagine them taking place in a space. The composer *manipulates* notes, moving them, reconfiguring them as if in space.

Response. There is an implied medium in which composers conceptually manipulate notes. While not a space in the ordinary sense, it has space-like traits. To understand why it is not a genuine space, but at most a pseudo-space, we will need to consider in turn the nature of structures that exist primarily in time, the ways in which sounds vary from one another, and what a musical 'note' is. We will find that the note is a highly abstract entity, not so much a sound as an abstract relationship

between qualities of sound. That it is the note's abstractness that allows it to be manipulated by a composer independently of time in a pseudo-space. For now, though, we will draw conclusions from what we have said so far in this chapter.

> CONCLUSIONS SO FAR IN THIS CHAPTER

We began by making the distinction between the material cause of a sensation and the form that sensation takes in our consciousness. We found that when hearing sound, all we have access to is the effect rather than the cause. Music is able to create a reality entirely with sound without help from any other sense. Without sight, there is nothing to lead us outwards into space towards the musicians or the musical instruments that are causes of the sounds. Material objects exist in space and without space, music exists without objects. Without space, it is as relevant to say that sounds occur within us as to say they exist externally to us. These conclusions will not need to be changed when, later in this chapter, we consider the abstract concept of the note and the pseudo-space in which it is manipulated. If space exists at all in music it is only if it is evoked secondarily in our imagination by the *primary* sensations of sound. However, whereas in painting, for instance in, if we see a swiftly flowing stream we are likely to hear ideated sensations of the water's sound, music is so complete unto itself that it requires no additional senses to augment it. Thus with music we have our first instance of an artistic reality on the spectrum, one that is different than the everyday reality because space and time are out of balance, and one which is also different than all the other artistic realities because space does not enter into the proportion at all.

> THE TEMPORAL ARTS IN GENERAL

> PERFORMANCE

Before considering the nature of structures that exist in time, we leave the thread of our argument for a moment to discuss the general traits of the temporal arts as a group. In the temporal arts, what the original creator does is often not sufficient on its own to give the work life, it is only sufficient to show someone *else*, a "performer", how to give it life. The need for the performer stems from a paradox at the heart of the temporal arts: that in spite of the fact that the author or composer has created the work once and for all time, the work needs to be *re*-made for it to exist *in* time. This paradox exists because time is, in these arts, more influential than space. What exists primarily in time must, by the nature of time, perish in time. What was once created in time must be re-created in time, if it is once more exist. Performance is this *re*-creation and it is absent in the spatial arts. A spatial work of art is able to persist in its existence between our experiences of it. The state we last left it in is no different than the state in which we first find it when we next encounter it. No activity on its part in time is required. It exists continuously; even the date of its creation is no longer relevant once it exists. The temporal work only exists during the time of the performance. Outside the performance it exists only as a spatial residue: a score, a script, etc..

The performance creates the work's artistic time. Within the everyday calendar it is a re-creation of something created before, but within the time of the performance the work has never existed before. Each performance is an original creation. The artistic time arises from within the everyday time, but once the performance begins, the clock in the artistic time is set to zero.

No performance requires any other performance. A work is no more complete by virtue of there being more than one performance. The price of a work requiring *re*-creation is that it is still in part a *creation*. No two performances will be the same because performance requires performers. The nature of the performance is based on the understanding of the performers, who are either different or have evolved through the everyday time since the last performance.

The nature of a temporal art work is that it can only be experienced as it evolves, as it endures through time. Towards this purpose the performer often uses a score. As displayed spatially in the score, the arch of a phrase of music, for instance, can be absorbed instantly by the eye. However that phrase doesn't exist as an experience unless we endure through it, moment through moment, through its course in time. Only without this *waiting does* the work collapses into a summary, a synopsis, or a score. Time takes this shapeless fabric, the collapsed score, and inflates it back into an experience.

In a performance, the performer stands in place of the original creator. If, as can be the case, the original creator is h'erself the performer, s'he is no longer acting as the original creator, but has assumed the role of an interpreter of h'er own work, just one such person among many others[8]. The special relation between the original creator and the work exists only during the creation phase of the work. Time flows differently through the creation phase than during the performance. For one thing, the composer does not need to hear the sounds occurring through their duration in time in order to create the work. After giving birth to the work, the work is dateless: it is as young or old as at any other performance. It does not keep "growing up"[9]. As with any other parent, the creator can only watch the work pursue its own life in the everyday world.

Two temporal arts, poetry and literature, may at first appear to be non-performed arts, but it is simply that we ourselves have assumed the role of performer. When we read a novel, we are the performer and the audience combined. Such one-to-one performances are probably more common in our age of individualism. Earlier these arts were more likely to recited in a group setting.

> TIME STARTS OVER AGAIN AT THE BEGINNING OF THE PERFORMANCE

Within an artistic reality we experience time and space differently than we do in the everyday reality. It is appropriate to speak of a specifically "artistic time" and "artistic space". The artistic time in a temporal work of art resides only in the artistic-space of the work , not outside it.
When we see Hamlet for the second or third time, why do we continue to experience the tension of the play, in spite of knowing how it will end up? Why do we still hope throughout that he will prevail, and are frustrated if he does not? Why do we believe till the very end that somehow, *this time*, he will not succumb? Why haven't we become inured and cynical, but instead still want to see the play again? A large part of the answer is that our knowledge of how the work ended exists only in the everyday time (of the everyday reality). Entering the artistic time of the work, as the play begins, is like drinking at the river Lethe. What we have learned previously is forgotten as we step into the work's stream of time. If now, we look backwards in time, we see only the history of Denmark. The work's future hasn't happened yet. The time of the new performance does not situate itself "after" the last performance. The previous performance does not connect as a *past* to this *present*. The continuity of everyday time flows underground until it surfaces again when the new performance is over.

At the beginning of a performance of Hamlet times starts afresh. The future, as it was once, is still all promise. Time has not yet been made cynical with experience. To be young is *not* to know that winter follows fall or that fall is the proximate cause of winter. It is to see in autumn what others see in the spring: growth and enchantment, glimpses of what is most vital about nature. The crueler meaning of time is still in the future. Now we experience only the blessed time which brought us to this very place and season right now, where suddenly we awake and find that all is bewitched and full of joy. All to soon will appear time the foreshadower, who informs us that the orange will shortly change to brown, that the leaves that we already see on the ground are, as a result of time, the leaves that *were* on the trees. The mind that is young in time forgets the memory of autumn by the time winter arrives, and so there is nothing to mourn. It is *time* that will fly away and not the leaves. Autumn remains forgotten until next October, and then it is rebirth, not a repetition.

When we are young, time has not yet led consciousness down predictable paths. Truth has not yet turned to dogma. Today feels as close to eternity as one might ever wish to get. The role of today is not that it is the advent of tomorrow. We can still keep pace with time when we are young, it has not yet outstripped our enthusiasm and endurance. The youth hurls h'erself at the future, creating the new, not knowing that thereby s'he also launches the invisible ropes of memory that will someday snare h'er in the past. When older, stepping into the flow of time of the temporal arts is like stepping into the fountain of youth. Time is what it once was.

It is important that as the work first begins we are introduced quickly to the material to be developed[10]. Our mind is at this moment open, receptive; we form attachments quickly. If too much time passes before being introduced to the intended principal material of the work, our interest will have already gone in a different direction, and inertia will prevent us from changing course; the work will become over long if it only now begins to develop its proper themes[11].

> THE FUTURE IS UNFORESEEABLE

We learn from the past so that we can cope with future eventualities. The future is not a threat if it resembles the past. The intellect, as it functions in the everyday reality, treats the future basically as a mirror image of the past reflected through the vantage point of the present. Nothing in it is novel or unforeseen in this intellectualized time. The true future, Bergson says, has one salient characteristic; it is unforeseeable. It contains the possibility of radical newness. It is unknowable because it doesn't exist, and cannot exist until it is the present. The intellect views the future as it will appear to us when it is past. The performance of temporal art attempts the creation within its future of what is truly new. Within the time flow of Hamlet, as it unfolds into our present, its future is unknowable, it has truly not happened yet, *anything* might happen[12].

> HOW THE PAST OF THE EVERYDAY TIME AFFECTS THE PRESENT OF >> THE ARTISTIC TIME

That the future within a performance is an unknown does not prevent our previous experiences of the same work from affording us greater insight and depth of appreciation in our current experience. Within the performance, however, this enrichment isn't added from outside, from the past, but oc-

curs within the present of the current performance. It does not take the form of memories but rather adds, figuratively speaking, the illumination by which we see things.

> STRUCTURE IN TIME, IN GENERAL

> HOW WE GRASP THE WHOLE OF A WORK IN TIME

If we try to define what we mean by the whole[13] of a work of temporal art, we are confronted with a paradox. We can only experience the work as it unrolls through time, so without time there is no access to the whole, but within time the whole remains always just beyond reach because we are only in contact with one part of the whole at a time. The resolution of this paradox lies in our use of the word "part". Bergson tells us that no matter how small the duration of time of which we try to be conscious, within it we are still aware that change is occurring, that time is still flowing. Any "part" is thus a specious division of the work, made as if the work existed in space rather than time. Space we can divide, space allows clear lines of division. A temporal work has no parts, small or large. In the shortest moment of our experience, we still experience the work flowing from its past into its future. All time interpenetrates. What we feel in the smallest moment acts throughout the work causing it to cohere into a whole. This is also why the work does not seem to consist of unrelated fragments which could as well have been in some other order.

Part of the confusion lies then in using the term *part*; additional confusion comes from speaking as well of the "whole". This term too is usually thought of spatially. We regard the work as if it were made of some subtle matter, that from *some* point of view can be seen all at once in some subtle space. Abetting this notion is that we can hold in our hands a "score" to the work. We take this to mean that the work can be there in its entirety, simultaneously in time. But in the experience of the symphony there is no place to step back and regard it. Underlying our quest for the whole of the work is a feeling that time is simply a mask, that we can get to the truth of the whole only by seeing *through* time, removing its illusion and contemplating the work in a "higher" realm, perhaps as some exalted concept or idea that includes within itself automatically the meaning of our entire experience of the work. This higher realm however is just space in one more of its disguise. Removing time from the work is like collapsing an accordion. Without air left in its bellows the accordion no longer can make sound. But, we may say, the whole of the work exists beyond time because it already exists before the performance begins. It is then like a spring that when wound up assumes a form that gives it the capacity to unwind a certain way in time. But what of the spring afterwards? An unwound spring gives no indication whether it ever was wound. Only time answers that question. We are left with only one possible meaning to wholeness in time, which is that if space makes a whole available to us all *at once* in time, then if we do away with space, it is not that we necessarily do away with the whole, it is simply that we must accept that the whole can be present *without* more than the present moment of the work being there before us. That though we experience only the current moment *of* the whole the whole is nonetheless present as the whole in that moment. The whole lives in every "now" of the piece, and exists in its entirety in the enduring now of the work. The self-identity of all the moments that are "nows" is the whole - a statement that means more than simply "the part reflects the whole". All the moments of time interpenetrate. The alternative to this, which is the way a whole presents itself to us in space, would be tantamount, for instance, to experiencing a symphony so that all the notes of the work were all sounding together at the same time. Such a whole would be just cacophony and the absence of any recognizable whole.

The past *will* always have an influence on the present, *but* not in terms of being literally present, but rather in deepening and enriching our experience of the present.

> STRUCTURE IN TIME IS EXPRESSED THROUGH ORDER

The *structure* of a temporal work of art occasions a certain ordering of our experience through time. Changing this order is tantamount to changing the structure. It is as important to say when an event arrives in a temporal work as to say that it does arrive or of what it consists. There is a paradox here too regarding time. Once in memory, past events, though remembered, are not necessarily remembered for their order of occurrence. The order cannot be considered abstractly, aside from our experiencing it as it happens, each event enduring its proper duration through consciousness. This in turn means that the *tempo* at which we perceive a work affects our perception of the structure.

> TRYING TO PUT A WORK BACK TOGETHER

The importance of order to structure in time can be vividly experienced if we need to reassemle a piece from temporal fragments. Hamlet will our usual example. We will make the task easier by keeping individual scenes intact. Our procedure would be to compare two scenes and evaluate which order makes more sense. Sometimes there will be obvious clues, as when one scene refers to events happening the other. Laertes needs to leave before he can return, Polonius needs to suggest observing Ophelia with Hamlet before the king and he actually watch them. Ambiguities will arise when two scenes contain entirely different characters and subject matter. We would need to try both orders inside a longer section of the play that we have already assembled.

Without the human-meaning in theatre as a guide, piecing the temporal fragments of a dance together would be a more formidable task. We would try matching ending positions of the dancers in one fragment with the starting position in each other fragment. Since dancers can appear more than one time in one position, we would also have to factor in the quality of motion within a fragment. Still the dancers might repeat something twice identically, which raises the question of whether it matters in which place we put it in the assembled work.

We've given ourselves a hidden advantage in our task of assembly. We have been allowing ourselves to compare two fragments as if both are equally available to us at once, going back and forth any number of times comparing fragments. If it's theatre, we are probably looking at printed copies. We have thus sneaked in space in place of time which should flow in a temporal work of art. A more realistic restraint would be that we would have to sit through each fragment from beginning to end, and then make a judgment about its order relative to what we remember of the other fragments we have already seen.

What we have been imagining is solely for the purpose of appreciating the role of order in a temporal work of art. Ultimately, removing any part of a temporal work from the flow of time is like removing a piece of living tissue from the body. It cannot live without the whole, and the whole, minus this part, may be so affected that it too can no longer live. It is only when we hold the script of the play in front of us that we mistakenly think that we can take a scissors and cut the play along certain lines of cleavage and have the parts lying side by side for comparison. If we are dealing

with an entity that is spatial to begin with then taking it apart is meaningful. We have all the pieces of a jigsaw puzzle in front of us at one time. The connections we effect between the pieces are made in space and not time.

> ARTISTIC TIME CAN CONCENTRATE RELEVANT EVENTS

Artistic time, relative to the everyday time, can represent either a concentration or diffusion of events of the everyday time. After many years, as I look back over my life, I come to realize that, though it was not apparent to me during the day to flux of events at the time, certain themes have had major importance to me: events that steered the course of my professional life, my romantic life, etc.. If I add up the actual time that these relevant events took to transpire, the sum might not be that great, perhaps measured in days or even hours. Time in everyday life acted to dilute and spread apart these events. Artistic time can re-concentrate these events by omitting irrelevant material. In a matter of hours the essential from an entire lifetime can be introduced, developed and concluded. In their new found proximity to each other, the essential events can exert an even stronger attraction or influence on each other than they did in the everyday reality. Time in the temporal arts can unify rather than separate.

> DEVELOPMENT

A key feature in the elaboration of a temporal work of art is the process of *development*. Some identifiable aspect of the work, which we can loosely term the "subject" undergoes a process of growth and maturation. This subject may be the inner character of a person in a play, a theme in a work of music, or simply a quality or idea of movement in a dance. The time spanned by the structure of the work provides ongoing opportunities to draw out, test, deepen and define, via the subject's reaction, the nature of the subject. The situations that arise in the work can specially be chosen that most probe and assay the character of the subject. Each incident arises in part out of how the subject reacted to the previous incident, so that there is no way to foresee all the events that will occur. To an unexpected event, the subject may react in an unexpected way, and grow thereby in unexpected way.

Incidents that would have little impact on the subject earlier in the work might be more significant later on. Here is a modest example. We meet someone for the first time, little knowing that they will become our best friend, that we will share many important experiences together. Many years later, after wearing h'er hair always the same way, our friend, without warning, changes hair style. We are surprised, and to a degree that is in direct proportion to how long a time had passed within our experience of h'er without the change having occurred. How different our reaction would be if s'he changed styles after we had only known h'er only a short time. And if we had first meet this person *after* s'he just made the change, we would not even know that a change had occurred. Or consider the difference in how beautiful our spouse's face is to us, while to a stranger it might seem ordinary. What is lacking in the second case is the significance that comes from the development in time of the relationship.

The significance of a term in a temporal order depends to a great measure on *when* it occurs in the process of development, that we have lived through all that preceded it in order to get to it. Development thus differs significantly in its use of time from *sequence* in which there is merely succes-

sion without growth, random change and repetition. If something merely repeats, it is denying to time its role as the inner dimension of change. Time itself thus becomes manifests in the process of development. Repetition, in contrast, borrows from space the notion that we can always come back to the same place as often as we want. If we don't *get* something this time around, we can get it the next time. In fact it is unimportant whether we get it or not, because time is denatured. Without development the present looses its status as a unique moment. What occurs *now* in the work through development, could not have occurred any sooner or later. It could not have happened at all if all that preceded it had not in fact happened first, and all that follows it depends upon it having happened.

> RECAPITULATION

Repetition still has a role to play within the context of development. The most notable case is the recapitulation in a "sonata form" movement in music[14]. The recapitulation is not meant to be perceived as a clone of the exposition, but rather as a necessary balancing force in the overall structure. When we first heard the opening of a work, we were not aware of its full potential in time: how it would grow. Development revealed this potential. The recapitulation is a confirmation that the development occurred, for we see now with older, wiser eyes. We reflect upon the past with deepened understanding[15]. Sometimes, what has intervened has had such profound consequences that, when we try to return literally to the beginning, we find that it refuses to be cast again into the identical form as before, but occurs differently than the exposition. Literal repetition tends to occur less and less as we proceed through the temporal arts. It is still found in poetry and dance, but abates in theatre, literature and film.

> WHEN A WORK SHOULD END

Development cannot continue forever. The progress of the seasons leads to the Autumn colors, but that in turn leads to wintry death. As one grows older, the face reflects more and more past experience, its happiness, tragedy, wisdom and folly. The face acquires character and depth, but at some point the process of aging, which has really continued all along, takes over and causes us simply to look old. Maturation is an organic process that leads to perfection, and then to decline. When a temporal process has risen to a moment of great beauty or profundity, we may feel that if only we could sustain that intensity for a few more moments, it would grow even further. Those moments come and go, but the intensity only subsides. The process has been forced past its climax. We can only look back longingly, as in the system of Plotinus [{explain}].

A work needs to know when to end, before ripeness turns to over-ripeness. Enough has been said. It no longer seems worthwhile to keep pace with the truth through time. Any more, and we loose interest in the very process that has sustained us so far. The work becomes time-heavy. Even if all has not been answered, at least we have become resigned to time itself which has propelled the quest. If the subject has been thoroughly developed, the subject serves no more purpose, it vanishes as did the walls of Jericho after Joshua went around them enough times to see it from all angles.

> TRUTH AND TIME

In the same way that we imputed exclusivity into the concept of reality in chapter one, we impute constancy or even immutability into the term truth. This sets up, in the temporal arts, an antagonism between the fixedness of truth and the nature of time as change. How does the temporal work convey truth? We answer by way of analogy. At a dance there are many couples. Among them is person A who is very in love person B, who with one of the other dancers. Unfortunately B is not paired with A, but is dancing with someone else. The lover cannot abide not having the beloved always in view. This presents a problem since the couples are always in motion. The best A can do is to continually try to adjust h'er position on the dance floor so that B, in whatever position s'he is in at the moment, remains in view. This requires quite a bit of maneuvering on A's part. Just when an open line of sight develops between them, some other couple moves into in the way and blocks the view. By the time that line of sight has cleared, B has moved to a different position. In this analogy, the beloved remains, constantly, the truth. Given the nature of reality (change), B's (truth's) very constancy necessitates a constant and readjustment on the part of A (the artist). As long as the dance of time continues, the lover will *change* h'er perspective relative to the beloved to keep the beloved in *constant* view. In the world of appearance (the world of time) the image (perspective) of beloved will constantly change. Additionally, since the lover does not want to raise suspicions in h'er own partner regarding the motives for h'er motions, A tries to make all h'er motions aesthetically convincing on their own, thus all the while staying alert to both h'er own immediate motion and to the more remote motion of the beloved. In the temporal work of art, the *appearance* of truth must change with time if our fidelity to the truth is to remain *constant*. While tending to the formal necessities of the moment, the works' exploration of the truth is continuing. The temporal work of art becomes a deep comment on the relation of truth to time. It creates the truth at the same time as creating the veil (time) through which we must see truth. Without time, we might never be aware that there is something beyond it remaining constant. Time is that through which we see truth "darkly" because we are *dazzled* by the brightness of the present. Time is a lens that distorts the truth and we try to understand its nature by trying to understand the nature of the distortion. The maypole dancer moves in a circle from a desire to both keep moving but to keep the maypole always in sight. The hub (the truth) remains still, and controls the nature of h'er motion.

> RELATIONSHIPS BETWEEN PAST, PRESENT AND FUTURE

When the next moment arrives, it either conforms to or deviates from expectations set up in the past. In a work there is an ongoing counterpoint between expectation and fact. There is also a contraction of possibility to fact. Where at the next a moment a great variety of things could possibly happen, only one thing does. This dizzying contraction repeats over and over again at each new moment. With a great work there is an experience of a profound sense of the aptness for each next moment: that of all the things that could happen next, what does happen is best.

Though the present represents the certainty of fact versus possibility, in another sense it is never complete unto itself. The future is impending. If for no other reason, the future becomes necessary because it *takes* us time to understand and be aware of the present. However, the future also introduces change from the present. What we would become aware of from what was just the present may alter in the process of our taking time to be aware of it. If for awareness we substitute the word description, then we anticipate a prominent features of literature, in which the *description* of the present opens up a new dimension in time that leads away from the present in which is occurring the very thing described.

Time's weaving of the fabric of the work's structure never stops, the cloth continually grows. Where the newest material is being added, we are most keenly aware of the change in the work's form. Later, what was new, disappears into the middle of the fabric. To notice it separately at a later time, we would have to separate it from the seamless continuity of the weave; but then there would be evidence of the stitching where we had to rejoin the part back to the whole.

The past, once it is past, ceases to flow in time. It must be actively recalled from memory, into the present, to reenter this flow. Memory is like a filing cabinet into which different items enter at different times. The place in which each item is put is usually not determined by the order in which they entered the cabinet, but using other form of comparison. Everything in the cabinet is retrievable, but it is the circumstances of the present that determine what we wish to recall. The structure of a temporal work contrives conditions in the present that encourage certain particular memories to be partially reactivated because they are relevant to the work's present.

The order in which things enter the past has a specific influence on the color of the present. At the time Hortatio first tells Hamlet of the his father's ghost, we havealready seen Hamlet at court, witnessed the tension between him and his mother and uncle, and understand that learning of the ghost of his father would have bitter relevance to him. Later, when Hamlet encounters the ghost, in one way, it is no longer as important whether he had learned of the ghost before or after the scene at court. Those scenes have become united in the memories we bring to the present, and function conjointly in our understanding of what Hamlet now is feeling. In another very important way, the specific order in which events occurred in the past of the play has relevance to the present. Here is an analogy. We are standing by a stream. At a point further upstream someone has a while ago (in the past) added colored dye to the water. It has, by now, changed the color of the water where it flows by us. The color and brightness we see depends on various factors: the amount of dye originally added, its strength or concentration per unit volume where we are, how far it traveled downstream to us from its point of origin, and the nature of the current of the water between the two points (its velocity, the depth or width of the stream, obstructions, etc.). The dye strongly colors our present if we are close to where it was added unless the current is so swift that the color diluted quickly. If so, there may be another place downstream, where the flow of the stream slows, backs up into eddies (reminiscences). The dye then re-concentrates in spite of the swiftness of the flow or its distance from the origin. The dye may also be of a nature that it is reactivated by certain local features, so it suddenly will appear more strongly or weakly. It may happen to be noon, and the lighting of the scene causes the color of the dye to be hidden, but moments later the sun goes behind clouds and we sense the dye again. The joy of noon now has within it more somber remembrances of the night that preceded it.

The individual events in the past have dissolved into each other through time, gradually changing the overcall hue of the present. By act two of Hamlet, recalling the order of the events in the scenes of act one has less relevance to us, the important thing is how they have intermingled in coloring the present[16]. Back in act one, when scene two occurred, the past, relative to it, consisted only of scene one, and was colored only by scene one. This combined with scene two to give a specific color to scene two. This combined color in turn combines with the color of scene three, and so on. A month-long trip to Europe can include several stops. We can vary the order of the trip without varying the content of what we do in any one city. Yet the quality of the trip will evolve quite different

depending on the order. Every moment in the past, when it was present, influenced its proximate future, which in turn became past and influenced its proximate future. Thus traces of every moment are found in the complexion of present.

The present, in reciprocal fashion, also colors the past, and has an effect upon the way we remember the *past*. Contrary to our simplified notion of the filing cabinet, memories are not static once they are stored. Every time a memory is recalled into the present, it is subtly or significantly recast and updated by what we have lived through in the interim. When lovers at a later date recall the events that transpired near the beginning of their relationship, they will color these events with the knowledge of what has passed since. They will import a significance to an early event that they could not have been aware of at the time. So too does every historian, for history is written after the fact. What we take to be the content of the past is but our perspective on that event colored by what transpired throughout the duration that has transpired since.

> THE WAYS QUALITY OF SOUNDS CAN VARY THROUGH TIME

At this point we resume the thread of our main argument about music. We left it having concluded that space does not directly enter into our experience of music except possibly in the form of the medium that is used by the composer in which to manipulate notes. We first look at the different qualities that sounds have, with the purpose of then showing that a note is not a direct manifestation of a quality of sound but an abstract relationship among the such qualities. Once we have established the nature of the note, we can consider why what appears as the space of the composer is not really space at all, thus closing the last door on space's role in our experience of music.

There are four ways in which one sound can be different than another. Three are loudness, pitch and timbre (tone quality). In a certain important way duration too acts as a way to distinguish one sound from another. These four "parameters" to sound are the reason why we can refer in the first place to sound*s*, plural, rather than sound in the singular. We consider each in turn.

> LOUDNESS

Loudness varies in only one way only: from softer to louder. The physical basis for differences in the perception of loudness lie in variations in the amplitude of sound waves. There is an inconsistency between the way the cause and the effect varies. For the perception of loudness to rise a steady rate, the amplitude of the waves needs to rise exponentially. When sounds get softer they gradually subside into silence. Silence however is not an entirely a negative state. We can be "struck" by the silence that ensues after a period of noise. The dying away of the orchestra's final chord leaves in its wake a growing awareness of silence taking its place.

> PITCH

While loudness varies in only one way, the situation for pitch is a more complicated. While on the one hand pitches seem to simply get higher or lower, within that general trend there is a locally repeating cycle of changes within each octave. Two notes an octave apart sound very similar, though just as clearly exhibiting a difference in highness or lowness. As with loudness, for pitch to rise at

what seems a steady rate, the frequency of the sound waves has to rise exponentially, doubling with each octave.

The physical cause for pitch lies in the number of times per unit of time that the amplitude of the sound wave changes from a minimum value to a maximum. If this change occurs frequently enough, instead of our perceiving rapid changes in loudness (the effect due to amplitude) we instead perceive something entirely new, pitch. Nothing in the perception of pitch suggests anything repeating over and over. Pitch is continuous in its conscious nature. Loudness and pitch are therefore akin cause-wise. "Long" term changes in amplitude are perceived as loudness, and short-term changes in amplitude are perceived, cumulatively, as pitch.

> TIMBRE

Timbre, or tone quality, refers to the fact that a clarinet and a violin playing the same pitch at the same loudness sound different. Loudness varied in one way. Pitch was a bit more complicated, two forms of the same type of variation one nesting within the other. If we ask in how timbres vary, the answer is unclear. There is no identifiable *way* in which it varies. For differences in loudness and pitch we could borrow words from space, such as greater and lesser, or higher and lower. This doesn't work with timbre. While we can make a subjective assessment of where a particular pitch or loudness stands in relation to the full range of pitches or loudness that we have experienced, this is not possible for timbre. There is no definable *shape* or *boundary* to the totality of our experiences of timbres. As with visual colors, there is nothing in their perceived natures to suggest that there should be any limit on their number[17].

When we listen to one timbre and then another, there is no identifiable variable which has changed subjectively from the one to the other. Timbre provides us with a good illustration of the difference between cause and effect. The cause of timbre, a single effect in perception, resides in the interplay between two different causal variables: amplitude and frequency. Amplitude alone occasions loudness. Frequency alone occasions pitch. Together, at least under certain circumstances, they occasion timbre. There is nothing in the nature of the causal mechanism of amplitude or frequency to suggest that a *third* effect should arise from them. Nor when we hear timbre, do we hear anything having to do with loudness or pitch. Specifically, timbre is the result of the differences in the amplitudes of the differently pitched overtones of a single sound wave[18], but only when there is no awareness on our part that these overtones exist as separate pitches. If we *were* to hear various overtones as separate pitches, the effect of timbre would go away and be replaced by the effect of a chord.

> IS DURATION A PARAMETER OF SOUND

Duration can be taken in two senses. The first is measurable: the difference between two positions on a clock. Duration is also what goes on in consciousness *during* the first type of duration. The first requires noting the end separately from the beginning, the second is what joins the beginning and ending, and allows us to distinguish in the first place the beginning from the end because one is in the past when the other occurs. The first we can precisely measure scientifically. Of the second we can have a subjective sense of its magnitude, based on the way it accumulates in our memory. The first type of duration is not a parameter of sound, the second can be considered a parameter.

Duration in time is actively *filled* by sound, unlike space which is passively filled with visual content. In music, more than with any other art, the aesthetic effect depends on both individual and relative durations of sounds. In comparing two sights, we would not consider the duration of each as a principal factor in distinguishing one from another. Not so for sounds. Relations of duration are as important to sounds as relations of pitch, loudness or timbre. The difference is that hearing is internal *and* time is internal. There is no space to differentiate sounds from consciousness. As space is the possibility of extension, so time is the possibility of duration consciously lived through. Music tells us as much about time as about anything else, and helps us be exquisitely aware of durations. Music, being the art of time alone. If there is to be any art at all in which duration would be a primary feature, it would be music.
At its greatest music creates rather than passively uses time. For sounds, *existence is duration* in time. For sight, *existence is presence* in space, which in turn must be brought alive through our conscious duration in time.

> STRUCTURE IN MUSIC

> THE "VIRTUAL" SPACE OF MUSIC

> THE HYPOSTASIS OF THE "NOTE"

In music, freed from obligations to space, time turns inwards and explores itself. In the everyday world, the relations between sounds are traced back to relations among the physical objects that are causes of the sounds. In music, sounds have relations that are based purely on the qualities they own as sounds alone. The basic "building block" of structure in music is the 'note'. It is such a familiar concept that we accept it as a naturally occurring phenomenon, ready to use. It is as if the composer merely has to assemble these found objects into different arrangements. Closer consideration shows that the note is not a natural fact of sound, but an abstract construction. It is already a complex organism, in the sense that a biological cell, though the basic building block of complex life forms, is itself already a highly evolved and complex entity.

The note is an abstract relationship among the four parameters of sound. One parameter in particular, pitch, remains relatively constant during the duration of a note[19]. The abstractness of a note is demonstrated by the fact that the composer can manipulate notes without ever hearing them, i.e. without having to wait for each to endure through time. Notes are what's left of sounds if we abstract from them their very sound. We could say that a note is an abstract idea, though the composer handles it more as if it were an abstract object existing in an abstract space. The note is not a material object because it has no mass, and therefore no inertia. It is not subject to any restrictions arising from the laws of cause and effect. It is an object that can be manipulated entirely according to aesthetic desires, subject to no restrictions but aesthetic taste.

> NOTES ARE PSEUDO OBJECTS MANIPULATED IN A PSEUDO SPACE

The note is an abstract versus a sensuous entity that is manipulated in an equally abstract pseudo-space. The relation between a C and a D remains when time is gone. It exists regardless of whether the two notes are sounded or not, which also means whether or not it has a specific duration. *Where* does this relation exist? It exists *as if* in space, although when we experience that relation-

ship in music, it is as sound, and therefore space is altogether absent. Just as imaginary numbers, once we grant them provisional existence, yield some of mathematics' richest insights, so the pseudo-space of music, once we act as if it exists, offers the benefits of actual space, but allows us to extend those benefits to things that do not occupy space and have sensual existence only in time. We could call this space imaginary rather than "pseudo" but it would be confused with the space of our imagination, which is a real space, in which can exist the images of objects, the space which we come to in poetry, the next art on the spectrum.

In this pseudo-space notes can be manipulated, moved and arranged with convenience. While having no dimensions, it contains figurative *room* in which notes can be moved relative to each other, similar to the implied medium in which the mathematician manipulates symbols and numbers[20]. The results of the manipulation of notes have spatial manifestations, but only result in changes in time regarding the order and qualities the sounds will have in time.

The pseudo-space that we are now talking about should not be confused with the space observed in the space of the printed notation for music. The score space is a visible space, the pseudo-space is not. Images exist in it. The results of the composer's manipulations in the pseudo-space must afterwards be transcribed into the visible notation space, which remains is permanent in time and is accessible to others. It is from the notation space that the musicians then transform notes (which until now have been abstract) into sounds. In neither of the two spaces do the notes "sound". One contains an imaginary medium in which notes can be "moved", the other contains a visual symbols for aural phenomena.

As the objects populating the pseudo-space are not material and exhibit no inertia, they can be effortlessly "lowered", "raised", transposed, augmented, diminished, inverted, etc., all in analogy to space but with results only in time. Sections can be developed, prolonged, curtailed, without enduring through the sensuous duration of the notes in consciousness. If a note is not apt for the composer's purpose, s'he need not wait till it finishes sounding to yank it from its place and send it the cosmic dust bin while putting another note in its place. Through manipulative gestures of thought the composer constructs the musical structure of the piece.

The pseudo space of most Western music does not have a very fine granularity. Pitches are resolved no further than to a half step[21]. Durations, in keeping with the abstract nature of the space, are never treated absolutely but only relatively to other durations in the form of mathematical ratios, which, again in Western music, are usually integral.

> THE ARBITRARINESS OF THE CONSTANCY OF PITCH

The most noticeable feature about a note, as we hear it, is that for a certain duration of time, pitch is coerced into remaining relatively constant. We take this constancy so much for granted that we forget that this is not what we encounter generally in nature. Most sounds around us exhibit more continuous variation in pitch, though there are conspicuous exceptions, such as bird calls or cetacean calls. Many of nature's sounds have no identifiable pitch at all. The same flux is true of the durations of sounds. They are never rounded off to form relations of "eighth notes" or "quarter notes" with each other. By holding pitch constant for a certain duration, a note temporarily resists the ten-

dency for sound to mutate. More generally the note is a resistance to change that coalesces at the wave front of time[22]. Music, by being built up out of notes, is built up out of hesitations in time.

The note's resistance to change cannot be complete, or time would not be paramount in music. At some point, usually sooner than later, it must yield to another note. If it lasts too long it looses its ontological identity as the active embodiment of resistance to change in time[23]. On an experiential level, it is the note's resistance to change that brings it to life as an illusory entity. The gale wind of time, normally an invisible force, is made manifest to us in music because it buffets the apparitions of notes and eventually dislodges them. That gale is even noticeable within a single note, because it produces a relative unsteadiness, or vibrato, which is the active token of the note's struggle during its lifetime with time, held at bay for the nonce[23]. In addition to the role played by pitch, the beginning of a note is often demarcated by a sudden increase in loudness: the attack. It signals the regrouping of the forces of resistance after their overthrow. Throughout the duration of the note there are also minor variations in timbre as well as additional changes in loudness.

> HOW ONE NOTE CHANGES TO THE NEXT. PULSE

Like the mayfly, whose existence is more for the continued propagation of the species than for itself, so a note yields its existence so that it can form a relation with the next note. While the existence of the note is exhausted in the stance it makes against time, the beauty of the note often has to do with the way it cedes to the next note. As in the circulatory system, there is a driving *pulse* whose purpose is to *move* a note through time, towards its eventuation into another note. A note is borne through time until it looses the power to bind pitch with loudness and timbre, and a new relationship is formed in its place. There are many possibilities of how the energy of time is transferred across the boundary of the notes. The new note can force the old note out of existence or just nudge it away. The previous note may try to linger or bow out quickly.

> DIFFERENT COMPOSERS CREATE DIFFERENT VIRTUAL SPACES

There is not just one musical pseudo-space. There are different ones, something that is noticeable when we compare the styles of the great composers. Let us use Bach and Beethoven as an example. In a Bach fugue, we can shuffle the pitch ranges of the voices relative to each other without appreciably changing the structure of the piece. The voice that was highest in pitch range can be transposed down one or more octaves. Voices that were in the middle can go to the top or bottom, etc.. When we listen the result the piece is, surprisingly, largely unchanged in its musical meaning and impact. It is as if the voices, regardless of their relative pitch range are transparent[24] to each other. In other composers' spaces, what is highest in pitch attracts the most attention, but in Bach no voice automatically attracts attention to itself to the detriment of the others. The voice that happens to be on top is not automatically the 'melody', *every* voice is the melody, each speaking as if it were "on top", as if there were no other pitches sounding higher than it. Bach's polyphony thrives in a pure atmosphere of idealized pitch relations, independent of range. One voice passes fluidly through another. If we try to do something similar to a piece by Beethoven the results are more damaging to the structural integrity of the piece. The sound is more noticeably altered. It doesn't sound as good. What Beethoven puts on bottom pitch-wise needs to be on bottom, and the same for what is on top. In contrast to the transparency of Bach's space, Beethoven's is more opaque, each voice does not automatically let through the others, the performer must take pains to allow them all to speak.

What seems possible in one composer's space seems impossible in another's. One way to get at the properties of a composer's space is to subject it to various stresses and strains, and to note when the piece stays recognizable and when its identity is compromise or altered beyond recognition. Some composers' spaces allow for changes in one area such as rhythm. In one composer's space we can change the tempo or the arrangement of the voices, but not the key. In another composer's space this can be reversed. Deforming tools might also include playing a passage backwards, or upside down, eliminating rhythm altogether and playing all the notes with the same duration, removing voices, adding voices, rearranging voices. We observe in each case the extent to which the particular deformation changed the recognizability of the piece. What produces little change in one composer's piece may change another's beyond recognition.

> THE VIRTUAL SPACE OF MUSIC PREFIGURES THE ACTUAL SPACE >> OF POETRY

It should be pointed out that our discussion of the note, and of the abstract space in which it exists, is outside the subject of this book for the simple reason that it is not evident to the listener during the experience phase of the work. Nothing of a sensuous nature can take up abode in this space. Notes are silent, un-experienced, they must be translated back into time alone for them to take on the clothing of sound. Notes are surrogates for sound when in the pseudo-space. They have the advantage of being instantly, i.e. timelessly, accessible to the composer. The reason we have discussed it in this chapter, in addition to that of shedding light on the creative process, is to prefigure the first real appearance of space on the spectrum: in poetry. There is a certain satisfaction in thinking that space is not altogether absent in the first art of the spectrum, but exists in a virtual form that will come to life in the second art.

At this point we have concluded what we need to say about space in music. The closest space comes to having a role in our experience of music is *if* we are aware of the pseudo-space of the composer simultaneously to listening to h'er composition. In every other art, though, space plays a more conventional role. Thus regardless of the stature which we give to the pseudo-space, there is no question that the spectrum of the arts, when approached from the temporal side, begins with the art of music.

> AN UNUSUAL WAY OF APPRECIATING THE STRUCTURE OF A PIECE

As music is the art of time, by the manipulation of time we can gain insight into its structure. Instead of hearing a piece from the start to end just once, we could do so over and over, but under special circumstances. The first time only a few of the notes in the piece actually sound, the remaining notes remain silent for their durations. Each time we hear the piece again, more silent-notes are turned into sounding-notes. This process is repeated until all the notes are sounding. Like the ocean retreating and gradually revealing the contour of the land underneath, at first we will see tiny islands of notes begin to appear in the ocean of silence. Soon the islands grow in size. Groups of islands form. Gradually the structure of the music will come into view. Though we are not creating the structure we are at least able sense how some of the connections in that structure are being made, how different parts reach out towards each other. We come to appreciate, as a living and growing entity, the structure of the piece. A second version of this procedure would be to add notes

forwards from the beginning and backwards from the end: a common method in constructing a tunnel. At the last step, two complete halves are joined in the middle. During the process the beginning section will come to have progressively more meaning and promise, while the ending section will come to seem more and more related to the first.

> EFFECTS IN TIME DUE TO SOUNDS AND THEIR COMBINATIONS

> MORE ABOUT PITCH

> A NOTE IS NOT A SINGLE PHENOMENON

The term chord is used to describe more than two notes sounding at once. A chord, however, is a relative term, because each single note in it, in an important sense, is itself a chord. Any note can be broken down into a fundamental frequency and its overtones[18]. Each of these can be isolated as a sound wave with its own frequency. Since frequency is the physical basis of pitch, we should then be able to speak of each overtone as being a different pitch. The fact that we cannot is somewhat astonishing. The more simply shaped sound waves of each overtone "add" algebraically into a single more complex sound wave that we associate with the note as a whole. This is no different than what happens to two complex sound waves, stemming from two different notes, when they occur simultaneously in the air. They, too, combine through algebraically into a single, even more complex, sound wave. What reaches the ear at any given moment, no matter how many sounds are present in the environment, is a single resultant, extremely complex sound wave. What the brain does with this sound wave is to prevent us from hearing as separate pitches the fundamentals and overtones from within a single note, thus allowing us to hear those notes as single phenomena. Our *inability* to hear partials as a chord *becomes* the possibility of hearing the chords that result from combinations of different notes (each containing partials). Otherwise we would live in a dense and indecipherable harmonic jungle of sound. It is somewhat of a mystery why we process sound data differently in these two cases. However, that we can, allows composers to make of harmony a voluntary rather than an involuntary effect.

> MORE ABOUT THE OCTAVE

When two notes, an octave apart, sound together, there is a degree of "consonance" only exceeded when two notes have identical pitches (i.e. when they are in unison with each other). If we let two notes start in unison, keep one note constant, and let the other gradually rise in pitch until it is at the octave, we will effect a voyage throughout the entire circle of the octave. If we keep track of the changing degrees of consonance and dissonance between the notes, we will find that it is not a smooth or linear passage. We will come across dissonance at the seconds, the tritone, and the sevenths. Between those regions of dissonance we will find regions of consonance at the thirds, perfect fourth and fifth, and sixths. The consonances vary in degree but never approach the consonance of the octave itself. If they did, we would hear the similarity expressed in the octave at these other intervals as well. Dissonance is greatest nearest the greatest consonances. Western music is founded on the miraculous disappearance of the strong dissonance of the major seventh as that interval widens but slightly and melts into the pure consonance of the octave. Thus the larger circle of the gamut is more complex than we first alleged, for it involves the addition of Ptolemaic epicycles within it. Two notes a perfect fifth also sound the "same" but just not as same as two notes at an

octave. Melodies, in tonal music, are thus able to move into and out of points of relative sameness. Pitch thus offers a rich aesthetic field, balancing different levels of variation and similarity, and offers the possibility of analogy without identical repetition. As for the physical basis for the sameness of the octave, it probably has to do with the fact that it is the only musical interval such that all the partials of the upper note are identical with partials in the lower pitch.

The field of pitch is then of the nature of a three-dimensional spiral that rises into the air, with internal loops within each complete revolution. Projected into two dimensions we would seem come back at the same point with each revolution, but seen in three dimensions we note the difference in our altitude at each octave. This represents a sophisticated multi-dimensional spatial complexity, yet it is occurring purely in qualities of sounds noted only in time.

It is worth drawing an analogy between the circle of the octave in hearing, and the circle of color for sight. If we travel from red in the direction of orange, then after violet we come back to our exact starting point, red. But this may be due only to the fact that we cannot see more than *one* "octave" of color (violet has about twice the frequency of red), that if we *could*, the next color, while looking like red (sounding like another C) would be in a different (the ultra-violet) octave.

> MISSING PITCHES: SILENCE

Once there is even one sound, there is no longer silence. When we hear a C we don't think that D and E are not sounding. Any region of space can remain noticeably empty whenever it is unoccupied. Objects in space can be perceived against an empty background, but sounds are not heard against a background of silence.

> RHYTHM

In the phenomenon of rhythm, the absolute durations of notes become secondary to the ratios *between* their durations. This means that the same rhythm can result from different sets of absolute durations. Rhythm therefore can be treated as an abstract entity, just as the note, and can be manipulated in the pseudo-space of the composer, where it can be manipulated into larger structural units of time. An identical series of pitches can generate vastly different melodies depending on the rhythm among the notes. The same rhythm can produce vastly different melodies by using different series of pitches[25]. This gives music great flexibility in terms of the variety obtainable without loosing an underlying unity.

We recognize the character of a rhythm without *taking time* to evaluate the time ratios involved. We can imitate a rhythmic pattern without being aware at all of what its ratio of durations. The ratio only exists abstractly, as if we have been able to set the components *side by side,* i.e. in space, and then measured one in terms of the other.

Rhythms can combine with other rhythms, either by embedding themselves within a rhythms of longer duration or coexisting simultaneously within others. A voice that is single, from a melodic point of view, can be compound in terms of revealing the superimposition of two or more rhythms. Even a single note can be experienced as a rhythm if we have reason to feel within a longer note a tying together of shorter notes.

Though rhythm usually is formed by notes, in a broader sense there can be a rhythm of any identifiable musical trait. There can be a rhythm of harmonies, a rhythm of longer events, etc..

> METER

Closely allied to rhythm is meter. While rhythm has to do with the ratios of duration among a series of notes, meter has to do with a repeating, abstract pattern emphases or pulses occurring as a backdrop to the notes. A note that begins at the place of a strong emphasis derives power from that fact alone, regardless of its actual loudness. A series of notes of equal loudness and duration (even the ticking of a metronome) will after a while seem to group themselves into repeating patterns of four, sometimes two or three. Our tendency to provide order to sameness is strong. Our body responds to regularly occurring pulses with repeated actual or virtual muscle movements. A sudden change in the timing of the pulses has the effect of throwing the body off balance. When important notes of a melody do not begin on strong emphases in the meter, a counterpoint or tension develops between the rhythm and the meter.

> HARMONY

Music is able to create multiplicity through both simultaneity and succession. It is one of the wonders of music that in harmony we can hear separately the original notes composing a chord and simultaneously hear a totally new effect due to the combination of the notes. It is unlike the multiple exposure in photography in which the presence of each image is diluted by the presence of the others. Each note remains clear. It is unlike in vision when colors are combined, with the result that the original colors are lost to perception, and we are left with simply one new color in place of the former colors. Moreover whereas various combinations of colors can result in the same combinative color {?}, we cannot look at a color and determine from what other colors it was made, or even if it is the result of any combining at all. In sound, it is clear whether there is one note sounding alone or more than one note sounding together. If together, each harmony results from only one unique combination of pitches. Moreover we can tell what the constituent notes are that made the harmony.

Since the result of the harmony is an additional effect not perceivable in the component notes separately, musical harmony is a whole that is greater than the sum of the parts as well as a whole that cannot exist without the parts. Musical harmony embodies the principle that unity can lie in the resolution of opposites *without* requiring that the opposing terms sacrifice their force or identity in the resolution. However this achievement is temporary, because harmony can only arise in time relative to a dissension that preceded, and if it lasts too long, it will no longer be perceived as a resolution. More often, the forces that were held together by the harmony, eventually begin to pursue independent paths again. The beauty of harmony is in this transience. The character of a harmony also reflects the manner in which the reconciliation of forces was brought about. For instance, we may suddenly realize that the harmony we now hear was the inevitable outcome of preceding events in which the harmony was unforeseen.

> MELODY

The feeling that a melody brings us is different than the feeling that any of its notes would separately bring us. Notes in the melody interpenetrate in spite of their sequentially[26]. The same note used a second time in a melody effects us differently than it did the first time. This change is lost if the note is removed from the melody. The same applies to the components of the *visual melody* of a dancer in motion. Rise and fall of pitch in a melody are often sensed as a rise and fall in energy. A rise in energy cannot be indefinitely sustained, and a melody cannot ascend in pitch without limit. While heading towards a goal or climax, a melody takes into account the situations it has gotten itself into in the moment, falling back, regrouping, then moving on. Within larger periods of rise and fall in pitch there are smaller such periods, which may in turn contain smaller ones, etc.. When in music theory we analyze a melody, we are looking at the melody as if it there in front of us already complete . This *complete* melody can exist only in retrospect after it's been heard, when it is no longer a melody. The effect of melody exists only within the fray of the exchange of past and future within the flowing solder of the present. In this flow each note swallows its own previous duration as it continues to endure.

> THE INTERACTION OF HARMONY WITH MELODY

Western music is based on the interaction of melody and harmony. "…melody is the surface of a series of harmonies (chords), and an unaccompanied melody that fails to imply clear harmonies is felt to be strange and vague…"[27]. Some melody notes allow the light of the implied chord to pass through transparently while others are in varying degrees more opaque, and create a tension by *how* they don't fit into the chord. A melody that consists only of notes belonging to the implied chord can be gradually sped up until it leaves us with simply the chord as a simultaneous phenomenon. Once, however, a melody has collapsed in this way into a chord, the original *order* of its notes in time is forever lost. The process of turning a melody into a chord is thus not reversible. Once time is removed between the notes, a chord is neutral regarding their order, no note is first or second, nothing in the sound of a chord suggests that there ever need to be a melody. For similar reasons, an indefinite number of melodies can rise out of the same chord.

Chords play a special role for the ear when listening to polyphony. A C-major chord, for example, consists of a root note (C) a third (E) and a fifth (G). It welcomes in equally any C, E, G, regardless of what octave it is in, or what instrument is playing it. Through this momentary act of fusion we have the opportunity to switch our awareness from one voice, which we may have been especially following in our awareness up until that chord, to another voice leading out of the chord. If we hear a succession of chords, there will be melodies formed by notes in the successive chords that are close to each other in pitch. This is another way of saying "counterpoint".

> TEMPO

A minute on the clock can seem short or long to us depending on circumstances. On the beach an hour passes in "minutes", while on the dentist's chair, minutes can pass like an "hour". Our subjective sense of the magnitude of a duration is tuned to the "tempo of consciousness"[28]. The temporal arts in general, and music in particular, have the property of allowing us to expand the range of this tempo by attracting our awareness to events that take place in either shorter or longer time frames than the events we are aware of in the everyday reality. It is not clear what the tempo of our consciousness was when we were first born. It may have differed widely from what it later became.

Through experience we may have tuned its rate in order to have us be aware of the types of events in our surroundings which most affect our survival needs. There is, however, no a priori reason why in our consciousness a second could not seem even as long as an hour, or a day as short as a second[29].

There is a similar relativity with regard to the objective tempo of a performance and how we perceive the work's structure. Structurally, nothing changes about a Bach fugue if it is played through in a matter of seconds (each note lasting hundredths of a second) or if each note lasts several minutes. As limiting cases, the entire fugue could transpire before we were even aware of its presence, or, the first note could last so long that might would die before getting to the second note. What *does* change with the work's tempo is how we perceive what is happening in the piece. Through changes in tempo we become aware of different levels of information in the piece. It is similar to how the increased or decreased magnification of an image allows us to see separate details previously fused together, or see larger structures previously lost in the details. What is true of space is true of time. Just as time lapse photography allows us to and perceive how a flower opens, so an increasing tempo allows us first to be aware of longer lines in the piece and the relationships of phrases to phrases. As tempo increases further, individual notes become "ornaments" in larger groups. We begin to loose our ability to form meaningful relationships out of local groups of notes. The original melodies disappear and are replaced by new melodies that are made up of the *average* pitches from within groups of notes. We can begin to grasp inside just our present awareness an entire section of a piece, but we have lost much of the content that distinguishes one section from another. Eventually all notes vanish into a more generalized flow of sound, that at last turns into a constant blur holding within its constant frame an inner pulsation and subtly changing inner texture. Finally we will no longer recognize that anything at all is changing. Thus, ironically, when change is fastest it creates the impression of a stasis. Stasis is also the result of movement in the opposite direction. If we keep slowing down a piece, eventually we become imprisoned in a single note. At any given stage of this process altering tempo, we are aware of several neighboring levels of information simultaneously.

> UNUSUAL EFFECTS OF TIME IN MUSIC

Without the distraction of space, what music does with time is focused back on time alone. Music can modify our conscious perception of time. Even the order of events in time can be affected. How a performer plays the newest note in a piece can affects how we *think* s'he played the previous note. The memory we retain of a particular event does not remain constant. It is constantly being revised by the present. How the new note begins can imply that the previous note could only have occurred in a certain way, even if that way is different than how that note was actually played moments ago when it was in the present. Since the previous note is still very close to the present in our awareness, we are unaware of altering its memory, we simply assume that we just heard the note played in the way implied by the present. Another example of a modified perception of time is a canon, in which two voices intone the same melody, but not at the same time, and often with some overlap between when one voice ends and the next voice begins. The sameness of the melodies creates a strong identity that is working *in spite* of time. We can feel as if we are both in the past and in the present at the same moment. Each voice proceeds as if it were in its *own* time. Within a single moment of our consciousness we are at two different moments in the piece's time. When the second voice begins we are both at the moment when it commences and the moment where the first

voice began. We note that voices are happening separately, but in another way we perceive beyond ordinary time and feel that the voices are identical and congruent. The converse of this is also possible, we can hear things as separate in time that occur simultaneously. When playing a Bach fugue it is hard to be aware of more than one voice at the very same instant. It is more likely that we rapidly turn our attention from one voice to another. As the next voices enters our awareness, we pick up its thread from the note that proceeded it in the same voice, taking care to link the remainder of the latter's sound into the new sound. As that linking back occurs, the listener feels as if s'he heard one voice and then went back in time to hear another voice, though the voices are occurring simultaneously[30].

A well constructed phrase feels balanced with regard to its arching up and the arching down. The rise and the fall are felt to occupy the same amount of time. On the clock, usually the fall is much shorter than the rise, but our way of perceiving how it occupies time is based more on how much of the rise is being cancelled out by the fall, than its objective length.

> IS THERE ANOTHER ART IN TIME ALONE

We are at the point in our plan where we should be moving to the art in whose experience we first experience space. Before proceeding, however, we should pause and ask whether music is the only art in which we encounter time alone. Can we imagine any other? This question is important to ask, for if two arts can occupy the same place on the spectrum, it would destroy much of the power of the principle of the spectrum as a means for contrasting arts. An interesting candidate would be an art that relied on sight rather than sound but still was in time alone. Is there such a thing? We earlier noted that the retina is a replica of the space of the external world, which replica is in turn preserved into conscious perception. How can we then see without being aware of space? The answer is that two of the parameters of sight, color and intensity, are purely temporal qualities, but that they automatically become tied with space by needing to be seen in an area in space. Is there a way to isolate color and intensity from an awareness of space?

> POSSIBILITY OF AN ART OF COLOR IN TIME ALONE

If an observer sits in the center of a uniformly lit, giant sphere, an environment is created in which changes in color can be perceived without changes in spatial content. The sphere, existing at a uniform distance in all directions, resembles looking at the sky. There is little or no sense of size, shape, or even that there is a surface there at all. The inside surface of the sphere is coated with a material onto which light can be projected. At any given moment the surface is lit with an absolutely uniform color and intensity, although this color can change with time. Regardless of direction, everywhere the same hue and the same intensity are perceived. Nothing stands out, nothing is differentiated from anything else. Nothing is there to measure, nothing to demarcate. Space offers little to this observer. Awareness of difference due to position in space is gradually stilled. A single color that is everywhere, may in fact end up not being thought of as being anywhere[31].

As the color changes there will be a qualitative changes in time alone. The only factors are what the color is at any moment and at what rate the color changes. Neither of these can be measured in terms of space. Only if more than one color were present at the same time would space be invoked as that which *explains* why we can be aware of more than one color at the same time.

Changes of color *adds* richness to many arts, but the question here is whether just those changes alone provide a rich enough basis for an art. Would there for instance be a rhythm? The durations of each color, at least in principle, set up a basis for a rhythm. If I look at a blinking amber traffic light, I sense, I *feel*, the ratio in time of the duration between when it is amber and when it is unlit. It is part of my experience of the light. But is this experience strong enough to be equal to the feeling of a musical rhythm in which the sounds themselves seem created and sustained by time itself. What can we build from these rhythms? What about harmony? In a painting we can sense a harmony between the colors occupying different areas. Can a harmony exist between colors seen first one and then another? Green, seen after red, produces a different color harmony than red, seen after green, but is this effect as pronounced as a musical harmony? More to the point, what can we build structurally from such color rhythms and color harmonies[32]? Musical harmony exists both simultaneously and sequentially, that is its richness due to time. Color looses half this richness. Thus while color adds tremendous richness to arts already in space, it is questionable how rich an art will result from color alone isolated from space. In appendix two we discuss the self-sufficiency of certain other senses for the purposes of art, and we will again draw the conclusion that only sight and hearing are capable, on their own, of sustaining an art.

Notes

[1] We can imagine a similar exchange, but one which would take place within a single sense. What if we responded to a greater amplitude in a sound wave not as an increase in loudness but as an increase in pitch? In exchange, a change in frequency in the wave would be perceived as a change in loudness. Nothing objectively prevents this. It is simply not the case.

[2] To find an explanation for why the it is confined just to this range, we have to look outside the nature of the cause and into the domain of utility. It is *useful* for us to respond only to a certain range of frequencies, because most of the sun's radiation is transmitted in what, in retrospect, we call the "visual" part of the electromagnetic spectrum.

[3] We defer to later in the chapter the issue of our apparent ability to determine the direction of a sound source from just the nature of a sound.

[4] We normally think of sight as revealing the content of space, but ironically in so doing it prevents us from knowing all of the content of space.

[5] The same can happen if we try to match a musical instrument we have never seen before to a sound we have heard before. Similar to this quandary is trying to figure out how to make that instrument produce sounds. Let us say it is a trombone. We try moving it around in space to see if that will generate a sound. We notice that it is a hollow, but then what? We try blowing through the tube but do not obtain a very interesting sound: that requires practice. Here is another instance of distancing an object from sound. If we listen on a recording to the oboe playing the opening of slow movement of Tchaikovsky's Fourth Symphony and look at the phonograph, nothing about the phonograph looks like an oboe. In an artistically nightmarish future, in which musical instruments have ceased to exist, and oboes are only heard on 'historical' recordings, it would be only provisionally correct to state that the physical cause for the sound of the oboe was the device playing the recording?

[6] The author has created a computer ear training method that specifically encourages the avoidance of quantifying aural impressions and focuses on qualitative assessments of sounds (see http://www.joebloom.com).

[7] We leave to the chapter on theatre the effect a common space has on linking performers and audience.

[8] The idea of the work pursuing its own career as an individual, separate from its author, was first introduced to me by my father, Julius Bloom, who was Executive Director of Carnegie Hall in New York during the 1960s and 70s.

[9] The desire to re-create sometimes affects the composer as well as the performer. Some regard Mahler's symphonies as a series of reincarnations of the same work, each time working towards a "better" performance.

[10] Normally we expect the statement of the themes at the opening of a work to be clear and unencumbered, leaving to the development their intertwining. The first movement of Charles Ives' "Concord Sonata" attempts the reverse. Towards the beginning the themes are combined in more complicated ways. As the movement proceeds they unravel from each other, with some of the simplest statements coming towards the end of the movement.

[11] It would be like watching a film, and after following the main character through half the film, a stranger passes the main character in the street, and the camera switches to the stranger and remains with h'er for the rest of the film.

[12] A corollary to the unforeseeability of the future within a single work applies with regard to different works by the same creator. From our standpoint in historical time, it is easy to identify a certain Beethoven sonata as being an "early" work. But early with regard to what? It is only because we know that there were later works that we call it early. No such comparison could be made when the work was new. Then, it represented the most final word from the composer, the most complete expression of his musical thoughts. At that time one could not see in it a foreshadowing of anything later. Foreshadowing requires knowledge on our part of afterwards. Otherwise there is no way to forecast what a later Beethoven work might sound like.

[13] Analogous to the question of what is a structural whole in time, is the question what do we mean by the "work" of (temporal) art. When performed, what is it exactly that is being performed? Is it an incarnation of the *work*? Do we hold Beethoven's Fifth Symphony in our hands if we are looking at its score. There are many scores of the work; what are they all copies of? Is the original autograph copy *the* work. Is it what went on in Beethoven's mind? Scores are spatial representations of the work, they can be multiplied indefinitely. In time, there are as many incarnations of the work as there are performances of it, including rehearsals or hearing the work in the imagination. Are all of these *the work*? Is there something that abides, that we can truly refer to as the work? There must be something because we recognize that it is Beethoven's Fifth every time we hear it. Is the work what is in our memory? The answers are ambiguous. At least with a spatial work of art there is a tangible physical presence that is identical to what we mean by the work. What the work is in a temporal art is harder to pin down. While we use the term work with a certain ease and clarity, it resists definition.

[14] The musical structure of the sonata form combines the bilateral symmetry of the human body (whose left and right sides are reflections of each other) with the notion of continued evolution or development of ideas in the main body in between. The first section, the "exposition", contains the initial statements of one, two, or even more themes. The presence of more than one theme usually occasions a modulation to new key. The themes receive an initial exploration, but they usually separate from each other. This is followed by a central section, the "development". Here the full potential of the themes begins to be unleashed. Themes split into fragments and recombine with each other in a process analogous to DNA, leading to the creation of a new individual forms which, though derivable from their forebears are distinct and unforeseen. The final section, or "recapitulation" begins with what seems to be a repeat of the exposition. The illusion persists for a while, until the second theme is prepared for in a different key than we anticipate. The central section, the development, acts as the fulcrum or balance between the exposition and recapitulation.

[15] In works of lesser merit the recapitulation fails to serve these purposes. It can seem simply like a repeat of the opening without other significance, even as a second performance of the same piece trying to masquerade as being part of the first performance.

[16] When first falling in love, the order of events is significant. First s'he gave h'er a rose, then they walked and talked, then they held hands, then they kissed. Each event prefigures the next, anxiously calling it forth. Once they are fully in

love, the order in which these first events occurred is not essential to the fact that the love presently exists. Initially, however, a change in the order could have had a significant impact on what ended up being.

[17] For years the author wished that he would discover a timbre no one had heard before. A new instrument of some sort, perhaps in four dimensions, whose shape would yield a genuinely new sound quality. This dream motivated his early experiments with electronic music.

[18] When, for instance, a string vibrates, it does not do so only with its entire length, it also subdivides so that each half, or third, or fourth… of the string vibrates in the same pattern as the other half, thirds, fourths… When we see the string in motion, its shape is the result of the addition of all these "partial" vibrations together. If we could isolate just that part of the vibration which takes place along the entire, undivided, string, we would be listening to the "fundamental frequency" or "first partial" of the string's composite vibration. If we could isolate just the motion of the string when subdivided into two parts, we would be listening to the "first overtone" or *second* partial. There is then a second overtone (or third partial) and so on. When the vibrating body is essentially one dimensional, as is a string, or a column of air in tube, the frequency of vibration of the second partial is twice that of the first. The frequency of the third partial is three times that of the first, and so on. Each partial vibrates with a loudness that is unrelated to the loudness of the other partials, but depends on the acoustic characteristics of the instrument,. It is the assortment of different degrees of loudness as applied to the different partials of the sound, that lends the sound its peculiar "timbre" or tone quality, so that which an oboe playing a C with a certain loudness sound different than a violin playing a C at the same loudness. Any partial in a sound can, with training, be isolated with the ear and heard separately from the rest of the note as a whole. It then appears then to our ears as a separate note, with a pitch that is different from the rest of the note which remains single.

[19] There is nothing, however, preordained about forming the note around pitch in particular. One could create a structural building block of sound around a constancy of loudness as well, or of timbre. The music that would result from the manipulation of these new entities would have different characteristics than the music are familiar with.

[20] An especially apt analogy would be when the mathematician uses spaces of more than three dimensions. They cannot be pictured by us as space but in them the mathematician easily manipulates mathematical objects.

[21] If we let the pitch of a note slowly rise, starting let us say at C and proceeding as far as C-sharp. Our ear will continue to identify the note as a C until it is more than half way to the C-sharp. Then, rather abruptly we identify it as a C-sharp. Until that point we merely think the c is "out of tune". It would be interesting to imagine music based on sounds that are always in the process of gradually changing pitch, not changing discretely as in Western music.

[22] Just as consciousness itself may be that which prevents the infinitely rapid unraveling of the history of the universe, so notes, by holding pitches constant for finite durations, prevent the flux of the piece from unraveling instantaneously, and slows it into the course of conscious time.

[23] In pieces by the American composer Morton Feldman notes can sometimes last a long period of times. The more familiar musical structures, which are built out of notes of shorter durations, are subdued. In their place we can become aware of a single note as itself a microcosm.

[24] My use of the word "transparent" stems from a program I saw when young that showed how Disney artists created animated features. If a character was walking through the woods, for instance, h'er figure would be drawn on a "transparency". Elements from the medium background were drawn on a second, the far background on a third.. The camera would shoot *through* the three layers. The trees furthest away would change their position most slowly in response to the character's motion, while the nearer trees would change somewhat faster.

[25] So powerful is a rhythm that one can take a series of random pitches, having no inherent melodic relation to one another, and simply by placing them within a framework of a constantly repeating rhythm, they will loose their randomness and sound orderly and related.

[26] "Might it not be said that, even if these notes succeed one another, yet we perceive them in one another, and that their totality may be compared to a living being whose parts, although distinct, permeate one another just because they are so closely connected? The proof is that, if we interrupt the rhythm by dwelling longer than is right on one note of the tune, it is not its exaggerated length, as length, which will warm us of our mistake, but the qualitative change thereby caused in the whole of the musical phrase". The "musical phrase … is constantly on the point of ending and constantly altered in its totality by the addition of some new note. Henri Bergson, "Time And Free Will"

[27] Sir Donald Francis Tovey, "Musical Articles from the Encyclopaedia Britannica", London, Oxford University Press, 1947.

[28] When the exposition of a sonata movement is repeated, it will seem longer the first time than the second. There is less uncertainty the second time where things are heading. It is not as "new", we take it more for granted, we are less attentive to how every note leads to the next.

[29] Depending on whether there are physical or chemical reactions that must occur in tandem with there being consciousness, we could speculate whether a subatomic meson, were it conscious, would be aware of the passage of an individual trillionth of a second, for otherwise its existence would be over before it knew that it existed. On the other end of the spectrum, we might speculate that a conscious rock would need to perceive the passage of a century as we do a minute or it would become too bored at the passage of time and would nod back into unconsciousness. One aspect of music particularly affected by tempo is the perception of rhythm. If notes sound too slowly or too fast, we will loose our ability to intuitively sense the relation of the duration of one note to another.

[30] An amusing analogy to this type of time distortion occurred to the author. When younger, whenever I noticed similarities between two pieces by different composers, regardless of which piece was written first, I always thought that the piece I got to know second was borrowing from or imitating the piece I got to know first. The important thing to me was the order in which they entered the time of my own history. I would not abandon this feeling even when admonished in the face of historical facts. It was also true that that how a later composer handled a certain phrase altered my perception of how an earlier composer handled a similar phrase.

[31] One might object that the observer still retains an internal sense of up and down, and left and right. That while the view may not change, the observer notices in which directions this sameness lies. If we could keep the observer in this environment for long enough, perhaps s'he would gradually loose the need to distinguish directions and the ability would atrophy. Though the viewer is unlikely to remain in this environment long enough for this to happen, we can at least imagine that, as in a sensory deprivation tank, the observer's sense of direction will at least be stilled.

[32] We can also exclude an effect in color similar to vibrato in sound. A rapid but narrow oscillation in the frequency of a sound is perceived not as a rapid change in pitch but an *enriching* of a steady pitch. With color, any rapid oscillation between two frequencies, i.e. two colors, produces no enrichment to the color, but simply the perception of whatever color single is obtained by mixing the two.
