

Exploring The World Of Music  
Program # 7  
"Timbre: The Color Of Music"  
Program Transcript

NARRATOR:

What is it that distinguishes the sound of one instrument or voice from another? What accounts for the infinite variety of sounds that can be produced? The quality of sound of instruments and voices are influenced by a number of factors that taken together produce what is called tone color or timbre.

ERNEST BROWN:

Timbre is tone quality, you know when you listen to a sound, when you listen to a musical note, you hear several things. You hear the basic note but you also hear some overtones. You hear some other sounds that are generated. The particular combination of overtones that you hear gives each musical instrument it's own sound. You could play a note say a G on a guitar and you could play that same note on a flute. The fundamental frequency of the note, the G, is the same but the timbre is not. And what makes the timbre is the is the mix of the overtones that you hear along with the fundamental note.

STEPHEN LEEK:

Timbre for me is the very essence of a particular sound and the way that it can be developed or changed in it's smallest part so that it becomes something else. It can be a very pure sound like for instance (sings "o") which is in a timbre is very pure and if we start applying different things to it, for instance, we can change the timbre of the sound by just changing the way that we create the sound (sings "o" "oh" "ah"). And in fact what I was just doing actually just opening up the vowel sound to explore the harmonic make up of that sound.

FRED STUBBS:

We take instruments to be things that produce tones, but each one of those tones in an instrument is actually a huge complex of smaller tones which we usually do not hear. And many musical instruments take advantage of the overtone series in order to produce musically useful tones. The overtones series is really quite simple. Behind every acoustically generated tone there is a series of other tones which are happening simultaneously.

GERALD SHAPIRO:

Musical timbres are made by combinations of overtones and you can do with a synthesizer what's called additive synthesis. You can build many overtones together piling them one on top of another different two times, four times, eight times the frequency. Then you make sounds in that way. And you begin to see that there are actually many more frequencies besides the fundamental frequency. When we change the overtone structure we change the sound or the timbre of what we're listening to. Every instrument has its own timbre, its own color, and it's based on its overtone structure.

FRED STUBBS:

The most crucial way that timbres are distinguished in instruments is by their general type. Most musical traditions have some kind of arrangement for classifying their musical instruments. In European traditions there have been certain time honored divisions between musical instruments. The most significant were set up by Erick Von Hornbostel and this system generally divides instruments into membranophones: those are the skin which are rubbed or struck with the mallet or the hand. Aerophones which set a column of air in vibration by splitting an air column over a sharp edge or by the movement of a reed. There's also chordophones which have stretched strings. Those of course can be set into motion by bows or by plectra or picks. Chordophones have all sorts of different timbres depending on what you bring to the instrument. Another category is idiophones. Those are those instruments that sound like themselves like a bell. Its entire structural material is its acoustic material. We don't hear the steel in a piano so much as we hear the string and the felt hammer itself. Idiophones sound like themselves and there's some other categories too. Of course the new category is electrophones.

GERALD SHAPIRO:

Any wave form that you can make in the air you can make in a wire an analogous wave form and so you can make music, you can make sounds electronically. An early example of the electrophone was the theramin where the player moves his hand further and closer to an antenna and changes the pitch of the sound that way. And a second antenna over here changes the amplitude of the sound that way. As the century developed the electric guitar came into very general use. Taking the sound of the guitar and picking up the sound on little pick ups which are like tiny microphones behind the strings and putting those sounds into an amplifier and back out of a speaker. And then of course after that you begin to come to electronic music synthesizers and on into the future, who knows what will be next.

FRED STUBBS:

Timbre is connected with musical instruments mostly by structure of the instrument and the materials that the instrument is made from. It's significant that musical instruments use precious natural materials from all over the world and many times these were living materials like the sinews or guts from different animals. Wood is my main medium, I've been working wood most of my life. And an instrument maker tries to figure out which of the design aspects of an instrument are mutable and which have to be preserved. And an instrument maker will change something about an instrument every time they build that instrument. But they will leave certain other things alone. In making my own neys I experiment with wall thickness, with the size of the tone holes, with the shape of the embouchure, with very small tiny little measurements in order to generate different kinds of tone. Ney is a Persian term meaning simply pipe. And neys in various forms appear from North Africa all the way to Western China in very many different kinds of forms. And the ney that I play is associated with Turkey. It is this shape, this profile here, that is said to give the Turkish Ney it's particular tonal timbre. But the real place where timbre lives is inside the instrumentalist's heart and head. If the instrumentalist doesn't hear the timbre in the instrument and the music, then the audience won't hear it either.

NARRATOR:

While materials and construction are critical in determining the timbral capabilities of an instrument, it is the musician who makes the instrument come to life. In essence the instrument becomes the unique musical voice of the player.

JOSHUA REDMAN:

I think the connection that you feel with an instrument is often times beyond literal or verbal description. But I think one thing that really attracted me to the sound of the tenor saxophone was it's incredible emotional range. The tenor saxophone can be a very very tender and sensitive instrument.

Or it can be a much more commanding aggressive powerful instrument.

And I like having those expressive options and I like having them integrated into the sound of one instrument.

RAY SPIEGEL:

The tabla drums are actually a set. It's two drums or individually called tabla bayan. Together it's called tabla. It's made, the right hand drum is

the tabla and it's the pitch drum, the high pitch drum. The left hand is the bass drum. The skin is held on by use of this camel strap and these wooden blocks are put in to increase or decrease tension. The farther down you hit them, the tighter the skin gets, the higher the tone goes. By pushing on the bayan we are able to get different tones and modulate the tones. Strike it with the first two fingers for what they call the open sound. And for the closed sound it's a flat hand slap. Some sounds together would "ta - din" small phrases (demonstrates). It's a very difficult instrument to master and I still haven't mastered it. I'm an artist and I'm a performer, a professional musician, but my basic view is that I'm studying it. I'm learning it as I go and I feel I have a lot to learn.

SIMON SHAHEEN:

The 'oud is actually the most prominent instrument in Arabic music. It has basically five double strings and one single low string. And it has a fingerboard here that is fretless, open fingerboard, and this is how the quaternary quality is being produced. Because you can slide and produce the sound. Usually the 'oud is being played in the context of the small ensemble or a larger one as an accompaniment to a vocalist or as a solo instrument. It's a very old instrument. It comes from the guitar family in Persia, it's the ancestor of the lute and the guitar family. The 'oud is actually the most prominent instrument in Arabic music and it's as valuable as the piano for the Western composer or performer. As far as I'm concerned this is one of the greatest instruments in the World. It's very dear to me.

NARRATOR:

The human voice is perhaps the most flexible of all instruments. The great variety of vocal timbres found around the world are reflected both in how singers render individual pitches and how they place their voices.

MIRJANA LAUSEVIC:

There are so many elements that create a particular type of sound that are much more variable than when you're plucking an instrument or playing an instrument in which you have an expected sound. There is some aspect of the voice that is unique to each person. When you're talking about vocal timbre you need to think about whether the sound is coming from your throat, from your chest, from your head, and it's different from one culture to the other. Of course if you are a member of a culture you sing a certain way. And you don't think, "Oh, I am using this much breath, I am placing my voice here or there," you imitate what you hear. And of course it's human voice and it will be individual and different from one person to

the other. But there are certain aspects of voice culture that are definitely being transmitted within the culture.

NARRATOR:

Tone color is an important aesthetic component in the music of any culture. Just as musical styles tend to change over time, so does the preference for types and qualities of musical sound. The use of timbre in European Renaissance music was quite different from what it is today.

TOM ZAJAC:

In the Renaissance there was a great proliferation of instruments of all sorts and instrumental colors tended to be very bold and bright.

GRANT HERREID:

Early players as far as we can tell played more instruments than modern players do, in the same way that a modern reed player in a jazz band will play saxophone and flute and bass clarinet maybe. A minstrel in a Renaissance court would be employed to play a stringed instrument but could also double on a wind instrument like the recorder. Some of the early instruments are limited in the range of colors.

TOM ZAJAC:

A modern oboist can get a full blossomy sound and a very focused sound and a nasty sound, but a player of say a crumhorn in the Renaissance, to take an obvious example, it makes this one sound. It's a very peculiar sound, a very nasal sound.

GRANT HERREID:

And so it seems that Renaissance musicians would rely on playing different instruments throughout an evening to give whoever was listening different tone colors or different timbres.

TOM ZAJAC:

We're not sure if composers wrote music with specific timbres in mind because they don't indicate for the most part what instruments are to be played on the music. We know from other sources, paintings showing instrumental combinations and written records, that there was basically two different concepts about instrumental combinations in the Renaissance. One was having a group of like sounding instruments, for example four recorders all of different sizes, playing together. It's a beautiful sound, somewhat like a pipe organ because you don't hear the individual voices as much as just beautiful sonority. The other concept was to have instruments from different families playing together, what sometimes called a mixed

concert or broken concert. And this could be a combination such as a violin, a flute, and two different sizes of lutes all playing together, each with a very distinct sound which tends to bring out each individual line. When you have four different instruments playing the same piece you really hear clearly the four different voices.

GRANT HERREID:

When we talk about timbre in terms of early music were talking about this palette of tone colors that was available to the people who played the music of the Renaissance or of the Middle Ages. And those of us involved in the "authentic" performance practice of Early music tried to, as a rule, use instruments that reflect these authentic tone colors or timbres. And so when I play the lute I'm playing an instrument that has a much different sound then say the classical guitar, the modern guitar, even though much of the music is very performable. But when I play Renaissance music on the lute, that was intended for the lute, I find that there's just many more ways that I can express the music.

NARRATOR:

The Human exploration of timbre is a continually evolving process whether the instrument is hundreds of years old or of contemporary origin, whether a voice is acoustically produced or electronically reproduced. Musicians and audiences are constantly defining and redefining the sounds which we call music.

CREDIT ROLL

## Exploring the World of Music

### Program #8

#### "Texture"

#### Program Transcript

NARRATOR:

The fabric of music can be woven in many different ways. Throughout the world people have devised fascinating methods of blending instruments and voice to produce an infinite variety of musical textures.

GAGE AVERILL:

Texture refers to the relationship of voices and instruments in an Ensemble. It's the way they're blended together into a musical whole.

ELMER HAMMOND:

What I'd like to do now is to start with the tenor section, then the alto, and the soprano, and then I'll add the bass. (music) one, two three and (chorus sings "Jesus is a rock in a weary land").

NARRATOR:

The subject of musical texture raises a number of questions. How are the different voices or instruments in a performance put together and organized?

ELMER HAMMOND:

Let's add the altos, altos, tenor, and bass, ready, and (chorus sings "Jesus is a rock in a weary land").

NARRATOR:

How many parts are there? Does one voice or melody stand out? How do the various parts relate to each other?

ELMER HAMMOND:

One more time, without piano...

MARK SLOBIN:

Any music is a set of preferences, we like it like that. This is how we think things go together, okay. And people really have strong preferences in terms of something like texture. There are large regions where people really only like to hear one or two things happening at the same time. There are other places where people seem to feel that's not enough. They want a really complex texture with a lot of different things going on at the

same time. These are choices, it's basically about an aesthetic and traditionally people have had very strong aesthetic feelings in terms of texture as much as anything else they do with their music.

MARY JO PAGANO:

Texture in music is basically the density or sparseness of the music. One very understandable example would be that if you think of a single voice or a single instrument and contrast that to an entire orchestra or an entire chorus, you can hear the difference between the thinness of one line and the density of a very large orchestra.

NARRATOR:

Western music scholars classify texture into four main categories: monophony, heterophony, homophony, and polyphony. While these categories are not employed everywhere, they can be used to talk about texture in all music.

NARRATOR:

Monophony means that the music is in one part, a solo voice or instrument. A good example of this is Irish Sean-NÓS singing. At a Sean-NÓS session song is a very personal expression. Although several singers are present, only one person sings at a time.

Where there are two or more musicians performing the same melody but in slightly different ways the texture is heterophonic. In this traditional Irish dance music everyone is playing the same tune. However, each musician may ornament or vary it according to his or her instrument or taste.

When a dominant melody is accompanied by one or more parts the texture is said to be homophonic. Nicaraguan ensemble "Grupo Camayo" sings accompanied by guitars and percussion, the melody is supported by the rest of the ensemble.

Music that simultaneously combines two or more different lines is said to be polyphonic. The term polyphony has specific meaning within the Western classical idiom, describing much of the multi-part music of the Middle Ages and the Renaissance. However, it is also used generally to describe any multi-part musical tradition. In the Javanese Gamelan of Indonesia, layers of music produced by gongs and metalophones create a polyphonic web of sound. These layers are made up of interlocking percussion parts and different melodic lines. Polyphony can be rhythmic as well as melodic as in the West African Manjani rhythm played on the



jembe family of drums. Here the lead drummer improvises over the different rhythmic patterns played by members of the group.

When the texture of music is monophonic, what can add richness to the single line? In Japan the shakuhachi, an end blown flute, has a long history as a solo instrument. In the honkyo ku or meditative style, great emphasis is placed on the tone color or timbre of each and every note.

TOMIE HAHN:

The roots of shakuhachi music lie in zen meditative practice. This sect of Buddhism they believe playing the shakuhachi, playing even a single tone, was a means or vehicle for enlightenment. Shakuhachi has such a palette of different color sounds. For example, if we want a very strong round sound, more like a western flute, very hard edged sound, we have (plays example). Very, more strong kind of shakuhachi sound. Then we also want a very airy sound so the same kind of (plays example).

NARRATOR:

When another instrument and voice are added to the shakuhachi, what kind of texture results?

TOMIE HAHN:

When shakuhachi plays with the ensemble, with koto and with vocalist, these kinds of lines together are heterophonic in nature. The same melody is being played but there are little nuances particular to each instrument. So the koto might play a line that sinks down (sings example) like this. Shakuhachi, they may not play in that kind of ornamentation, that kind of subtlety, so we might play just an introductory note to the phrase, where we play (sings example). All of these various sounds create such a beautiful heterophonic texture.

NARRATOR:

Ganga, a polyphonic song form, is performed throughout Bosnia and Herzegovina. This heartfelt music is sung outdoors by groups of men or women. The lyrics reflect personal experiences, themes of love or the singers connection to community and tradition. One of the intentions of singing ganga is to combine the voices in a way that results in a powerful and resonant texture.

MIRJANA LAUSEVIC:

If we are listening to ganga we can think of texture in terms of one voice being relatively speaking, thin in comparison with two voices that thicken the texture. We can also think of texture in the context of just single voice

the neck ensembles. They're carried around the neck. And this limits the number and types of instruments their range and the texture is as a result thinner. When you place these instruments on stands and begin to arrange them on a stage, each player has access to more pans, more range, the texture thickens up, the stageside band is a small version of this. The largest band in Trinidad is the conventional steelband and conventional bands are wheeled onto stage for the carnival performances and these ensembles number one hundred to one hundred and twenty players with major sections for each instrument. The dynamic level of these bands is extraordinary that you can hear these for miles around and the texture as a result is extremely thick and powerful.

NARRATOR:

Within the Western classical tradition, composers have written for a large variety of ensembles, ranging from the soloist to orchestras of more than one hundred players. As a result, textures may vary significantly. Even within one piece they may shift from moment to moment.

MARY JO PAGANO:

Composers love to write for more than one instrument. Sometimes they will write for, combinations, small combinations of instruments and if there's more than two players, that's called chamber music. The piano trio is a very popular ensemble. In a piano trio we have a piano, we have a violin and we have a cello.

NARRATOR:

For the chamber musician an awareness of textural changes and how each part fits into the overall work at any given moment, is critical to a successful performance.

TIMOTHY YING:

The Ghost Trio has an amazing variety of textures within it. For instance, right at the very beginning you have an abrupt and almost violent start. And the interesting thing is it's completely in unison. The violin, the cello and the piano are all playing the exact same notes. So that's one kind of texture. And then immediately after that you get not only a change in texture but a change in the mood where the cello takes a very beautiful solo all of a sudden and we accompany, and then I answer the cello with a melody on the violin. So you get these very sudden shifts in character and in texture, it's one of the big challenges of playing the piece.

DAVID YING:

huge ensemble, the great diversity of musical textures found around the world is unlimited.

Credit Roll

Exploring The World Of Music  
Program # 9  
"Harmony"  
Program Transcript

NARRATOR

Much of the world's music involves the interaction of two or more tones being sounded simultaneously. This interaction, how the pitches relate to each other is defined in western music theory as harmony.

TIMOTHY YING

To me harmony is similar to the spice that you use when you're creating a sauce. You've got a melody, there are many different ways you can harmonize the same melody and the way you choose to harmonize it is what will give you a different emotional response. So in that sense I really feel that the harmony is responsible for how a melody makes you feel.

RAVE TESAR

Harmony can best be described as notes sounding together in combination, pitches that are stacked on top of one another. If we hear only a melody by itself, with no harmonic accompaniment, it might sound something like this (plays). Now if we hear an accompaniment to it this would be considered harmonizing the melody. This hand is going to play the harmonic accompaniment, this hand will play the melody again.

ERNEST BROWN

If you look at harmony as the sounding of a number of musical notes at the same time, it's not a phenomenon that is confined to Europe or the United States. It happens in a million different ways all around the world. In Indonesia, in Gamelan music, you have a kind of harmony because you have notes that are tuned together that are being sounded simultaneously. In Zimbabwean Mbira music there is a kind of harmony, although Africans don't have words for chord and don't have a word for harmony. In a general sense harmony means being in agreement. You can say that some people are working in harmony, they're working in agreement with each other toward a common goal. In music it's similar, musical notes, musical pitches can be in agreement with each other. What constitutes agreement is the key question. In Eastern Europe there are some sounds that they think are in agreement that most people who are not from Eastern Europe will think are very very much in disagreement in the style of music called Ganga. In Gangan music they sound notes at the same time that are very very close together. And in Bosnia that sound is of the essence of music.

What constitutes being in agreement or being dissonant or being consonant is a culturally determined thing. And it can change over time.

#### NARRATOR

Within the Western Classical tradition ideas have varied over time as to what combinations of notes make good harmony. The story of how these ideas developed can be traced back through the Baroque, Renaissance and Medieval periods.

#### TOM ZAJAC

Well the term harmony is used in Western music to describe the simultaneous sounding of several notes, what we call chords. That's what we use as the basis of our music in the 19th and 20th Century, but it really wasn't always the case. In order to understand the development of harmony you have to really go back to the very beginnings of Western music to the origin of Plainchants. Plainchant is a term used to describe the singing of the sacred text in the Christian Church. Plainchant is always just one line of music. As if only one person's singing. But often times several people would be singing this music at the same time but they would always be singing in unison, the same melody exactly at the same time. But around the year 900 we know from some treatises that survive, that they were adding lines on top of these Plainchant originals. At first it was a line that would move exactly in parallel contour with the original melody and one theory is that because men and boys often sang together in the liturgical services and the boys just didn't have voices low enough to sing with the men, they would sing as best they can in their own range and it wound up being just not an octave higher and not in unison they would have to sing a fifth higher, about five notes higher than where the men could sing. And so it was an accidental development that these two lines were sung simultaneously a fifth apart. The church musicians must have really liked the sound because they really took off on this idea and soon there developed a free form where the added line was not tied to the melodic contour of the original melody, but sometimes went up when the original Plainchant went down or vice versa. Eventually even more lines were added so that in the late middle ages, around the year 1400 for example, three voices was the norm. By the year 1500, a hundred years later, four voices were the norm. The texture of having these four voices work together was such that there was a lot of imitation between the four lines. And it was rather playful, the four parts would weave in and out of each other, they would chase each other, echo each other, and always come to a nice chord at the end. The notes were sounding together forming chords, even if the composer didn't think of them as chords.

GRANT HERREID

Certain notes would line up at a certain time and create a chord. And in the Renaissance in the 15th, 16th centuries these harmonies were sort of the result of the different lines of polyphony as they sort of made a tapestry of music all together.

TOM ZAJAC

Composers became increasingly aware of these vertical seniorities or chords. By the end of the 16th century composers were ready to drop the middle lines of a standard four part texture and just keep the top and bottom lines. Why did they do this? For a very good reason. This is at the time when the earliest operas were being written and the solo song was of prime importance. In these new art forms the composer intended to get across the text of the song in as clear and immediate way as possible. So by getting rid of the middle lines he focused all the attention on that top line so you could really hear what the singer was singing.

GRANT HERREID

The melody and the bass became the two most important voices as the inner voices became less important.

TOM ZAJAC

What the composer substituted for those middle lines was little chord symbols that he wrote above the notes of the bass line and the instruments that played that bass line were the instruments that can actually play more than one note at a time, instruments such as the lute, harpsichord, organ, and performers became adept at reading these symbols and knowing what notes to add on top of the bass line.

GRANT HERREID

All written in this shorthand of figures over the bass line. It probably saved a lot of paper.

TOM ZAJAC

The use of the figured bass adding symbols above these bass notes is really the whole foundation of our modern concept of harmony.

NARRATOR

The harmony that underlies much of the standard classical and popular music we hear today was developed by the 18th century. It involves rules

and conventions about how chords are constructed and how they progress from one to the next.

#### MARY JO PAGANO

A chord will have certain sounds or colors that give the composer a lot of choices in how he's going to make a piece sound. In fact it's kind of like a painter's palette. They have a palette of different colors to choose from and a composer has different chords or harmony to choose from to make his piece come alive. When a composer takes chords and strings them along one after another that's called a chord progression. Here's a very simple chord progression (plays). Three chords coming back to the first chord. In a chord progression often the chords will lead to a point of tension and then you have to have resolution. See if you can hear (plays) the tension of this one, it wants to resolve it's not finished, and then we come home.

#### NARRATOR

The idea of moving music to and from a tonal center is referred to in Western music as tonality.

#### GERALD SHAPIRO

This is the really great discovery in European music where, you know where home is. You have a tonal center. If I go like this (plays) and I stop there, after a while you have to run down and (plays) turn off the light or something like that. You say, I'm not done yet. He's saying the end the end the end over and over again so you don't make any mistake about it. This symphony which has taken 45 minutes is done. And so whenever you talk about harmony in our context, you're talking about tonality, about the way the harmony shapes the movement of the music. And that's what provides that sense of shape and direction and flow.

#### DAVID YING

We as musicians would like to sort of define harmonies and the way they operate because they create within us a set of expectations when I hear a chord like this (plays) I want to hear (plays) as a resolution of the first chord. And those expectations are important and they're very conditioned to us especially in Western civilizations. What is really exciting about harmony is when those conventions are gone against. At the beginning of the Brahms B Major Trio there are certain notes like when I play with the violin this sort of melody in sixths, not every interval is a sixth. Even if we're not aware technically of what's going on, your ear picks this up, it disturbs our sense of emotions and that's one reason why music stirs us.

MARY JO PAGANO

Harmony in Western classical music has always kind of come with a set of rules. Composers were supposed to follow those rules. Of course being creative people they also wanted to explore further tonal possibilities. So each composer would try to take harmony to kind of the next step. By the end of the 19th century composers had moved harmony almost to a breaking point. They had basically explored as far as they could go and then they decided to break with harmony and tonality. And that's when atonal music came in. It was so to the edge that you don't have a neat clean predictable harmonic progression.

NARRATOR

While much of Western Classical Music in the twentieth century has moved away from tonality, popular music and traditional jazz have not. In jazz it is the chord progression of the tune that provides the foundation for the improvisations of the soloist.

RAVE TESAR

If I'm playing with a group, I have to coordinate certain elements of the harmonic accompaniment with other players particularly the bass player. He and I have got to be in agreement.

MARK BERNSTEIN

The main function of the bass is to play the bottom note of a chord. That's pretty much what you're hired for, that's your function, that's your responsibility. Outside of that you can play other notes in the chord, for instance the piano player or the guitar player is playing a G chord, the root of that chord is a G note. Now other notes in the G chord would be the G and the B or the third, moving up to the fifth which is D and then in the octave another G at the top. You can use those notes to create an interesting line, you know, that's the first, those are the most common tones, the most inside notes to play that will agree with what the piano player is playing.

RAVE TESAR

After we agree on the basic harmony we can still shape each individual chord a little bit differently. The page may call for E minor, 7, A, D major so it'll give us a description of chords. But I can play the chords in different registers. I can play them close. I can spread the notes out so I can change the general texture of the chord so we have the freedom to improvise harmonically. A very important thing to be listening for is the



soloist. I have got to listen to that person and play forms of the chord that are hopefully going to best complement the melodies that the soloist is playing. Let's just say somebody plays something and they're playing a lot of notes, they're playing a very fast passage. Maybe I want to stay out of their way and not fill things up and just play a chord and hold it out. Let's say the person's holding one long note and they're sustaining it and it's growing dynamically and they're really milking this one long note, I may want to play (plays), I may want to play a rising pattern to create some kind of further supporting tension for what that person is trying to do. You want to have the soloist have the freedom to choose their direction yet you want to give them some support and that might mean sort of helping to push them in a direction, even if maybe it's not where they were not intending to go originally because that's where the best performances sometimes come from, those little surprise turns that music can take when you're improvising.

#### MARK SLOBIN

Harmony is a word that was developed to understand Western music, that is music of the European and American traditions over about the last 500 years. When people started going out from that tradition and running into the musics of the rest of the world, they needed words to talk about how those other musics work that didn't have our tradition. So harmony is applied sometimes to other kinds of music than the music it was meant to describe.

#### NARRATOR

There are many forms of harmony found throughout Africa. In Zimbabwe one of the most common traditional harmony producing instruments is called the Mbira. Mbiras are often used to accompany song and dance. They are constructed with metal keys fixed to a sound box that is often surrounded by a gourd resonator.

#### ERNEST BROWN

In Africa there is no word for chord and there is no word for harmony but there are chords in African music and there is harmony in African music. For example, in Zimbabwean Mbira music, the chords will consist of two notes being sounded simultaneously that are a fourth or a fifth or an octave apart. And that's what the harmony is built on.

Now that song consists of a series of two note chords that are being sounded in sequence so there's a chord progression. There are two phrases, here's the first phrase (plays). Here's the second phrase (plays).

So the whole song consists of two phrases, each of which has three chords. Now that's the basic framework, I want to elaborate on it so I'm going to take some notes out of the chords, play them independently of each other and develop a more interesting melody. So here we go (plays). The chord progressions in Mbira music are very much like the chord progressions in Jazz or the chord progressions in Bach. They are the underlying framework. In a jazz context, you improvise over a recurrent cycle of chords, of chord progression. In Mbira music it's the same. You improvise over a recurring chord progression. You don't have the word for chord and you don't have an explicit body of musical theory. But if you play notes that are not in the chord your teacher will tell you. Or someone in the audience will tell you. Or they'll throw a stick at you. You don't do that. They'll say "Here, leave that alone, don't play that note here" and they'll show you, "here play this one." And if you analyze what they're telling you to play, they're telling you to play the notes that are within the chord. So they're hearing the relationship of tones to each other, they're hearing chords but you don't have a word for it. And really that was the situation that existed in Western Europe before music theory was developed. Music theory is something that is based upon practice. It's based upon what musicians do. You look at what musicians do and you find some patterns in it and then you write down those patterns and you can make that prescriptive. You can make those into rules.

#### NARRATOR

While some musical genres have explicit, formalized rules for harmony, others do not. But the impulse to sound notes together, to make harmony, is an essential part of music in many diverse cultures around the world.

#### CREDIT ROLL

Exploring The World of Music  
Program #10  
"Form: The Shape of Music"  
Program Transcript

NARRATOR

Music, whether composed or improvised, is shaped and organized by people. Underlying this creation there is always some sort of structure which both guides the artist in creating the music and provides an anchor for the listener. This framework is the music's form.

TIMOTHY YING

Form in music I think is basically a response to the problem that you have to structure the artistic experience somehow. Music is a little bit different from some of the other arts, for instance with a painting you can see the whole painting at once. Music occurs through time.

MARY JO PAGANO

Form is kind of like a blueprint. In the same way that an architect might decide to, well first maybe he'll have to decide whether he's going to make a skyscraper whether he's going to make a little log cabin. They're different blueprints.

RAVE TESAR

Form is one of the things that most people understand without knowing that they understand it. Because it's one of the simplest aspects of music. For example, if the basic rhythm is something that you could tap your foot to, most people can understand that and hear it. Well most people know that when they listen to their favorite popular piece of music that some sections of the music come back again. These are things that are apparent to everybody so it's something that people understand whether they dwell upon it or even think they don't understand.

GAGE AVERILL

When we're talking about form we're talking about the shape that a piece or a presentation or a performance of music takes, from beginning to end. Included in this is a notion that a piece has a beginning, an end, and some way of dividing a piece or structuring a piece from moment to moment. Human beings are pattern-seeking creatures. We want to understand a larger unit as being made up of smaller units.

NARRATOR

All musical traditions have established form. These forms can be looked at as models or formulas which are used by composers and performers to structure their music over time. However the way this is accomplished can vary significantly from one culture to another.

DAVID YING

I think everyone views form differently. Like there are many ways you could organize music just as, you know, if you or I were to organize our daily schedule, we'd all have our own way of doing it. It so happens that in Western Classical Music it's organized around the idea of things repeating and things developing. And the sort of constant conflict between repeating something that you know or changing it.

MARY JO PAGANO

In Western Classical Music there are many different kinds of forms and some of them are shared by other musical cultures. But there's one form that is very unique to Western Classical Music and is very much favored, that's called the sonata form. Now the sonata form is not just used for what we call sonatas, it's also usually the first movement of a symphony is in a sonata form, first movement of a piano trio, first movement of string quartets. It's used often.

DAVID YING

Sonata form is sort of fancy name that's been developed over the years, mainly, I think, because so many composers have written music that sort of falls into that form. Has these very technical terms of exposition and a development section and finally a recapitulation section but the idea of it is really not nearly so complicated. Again it's this idea of what's the same and what's different.

MARY JO PAGANO

The first section is called the exposition, the second section is called the development, and the third section is called the recapitulation. And each of those terms are self explanatory as to the function of those sections. In other words, I have here the Beethoven Trio Opus 1 No.3 in C Minor and you can hear the opening theme begins like this. And then of course it continues on. This is exposed, a theme, an opening idea. Every exposition must have two themes and usually the second theme is contrasting. Here is the second theme in the Beethoven C Minor Trio.

DAVID YING

You want to remember as much as you can about those first notes that you hear because a good composer's going to take those notes and do different things with them. For example, this "uhhhh" which was the ending of... this little bit. In the development section, gets played with in all different sorts of ways, you hear it pass from instrument to instrument just that little idea.

MARY JO PAGANO

The development section is probably one of the reasons why composers really favor this form. Because it gives them the chance to explore tonal possibilities.

DAVID YING

Just when the development section seems to be getting crazier and crazier, harmonies start getting odder and odder and you wonder what's gone wrong with this piece. It sounds so strange and not at home. Well, just at that moment you'll hear... the beginning of the piece again. But this time instead of soft and ominous it comes crashing in with the most, sort of, the biggest amount of passion and really intense.

TIMOTHY YING

There are many different kinds of form but essentially they all take the same tact, that something has to happen over the course of time and you have various things that will come back and repeat. And those repetitions are what signals your ear, they're the sign points for structure. So whether it's a sonata form, whether it's a binary or ternary form, these oral signpoints are what indicate to you when the various sections occur.

NARRATOR

Jazz as opposed to much of Western Classical Music is an improvised medium. The musicians create a large part of the music while they're playing. However, pre-composed songs often play a vital role in structuring a Jazz performance.

RAVE TESAR

We have so much room for improvisational expression that we need something as a band to keep us together and it is the form itself. Song that we play, "The Comet" is what we call an AABA form. The AABA song form is very typical for many many popular compositions. If you were to follow a piece of sheet music and look at the way it was constructed you would see we'd play an A section which is eight bars, another A section which is eight bars, we play a bridge which would be a different section

and then we go back and we play another A section. Now if you listen to the melody, it's going to be stated in a thirty-two bar context. Same thing. Bridge. Back to the top. End of thirty-two bars. And then, those same thirty-two measures of music or the structure that we're playing in, goes around and around and around and the musicians improvise on that form. And when we improvise, we're improvising on that same form. A lot of people ask the question "How do you know what to play when you're done playing the melody? How do you all know when to start and stop together?" Form is crucial. Later in the piece we may break the form down into smaller sections where we'll have a dialogue between the instruments. I might play four measures, and the drums might be featured for four measures, and the saxophone might play four measures, then again featuring the drums. We call it trading. We start passing the ball around the band a little bit and we trade back and forth four measure phrases. And the drums would take it. The way of featuring a drummer without maybe necessarily all of a sudden having the music stop and feature only the drummer.

#### BILL TESAR

The interplay can be back and forth between one other instrument or the entire band so it's an opportunity for the drummer to lend a little excitement to the piece, to make his statement very briefly and succinctly.

#### RAVE TESAR

And then all of a sudden melody just comes back in we all seem to know where we are, magically, but we were just really counting measures.

#### NARRATOR

Unlike the majority of Western Classical or Popular Music where repetition of a theme, section, or verse plays a big role in determining form, traditional Japanese music unfolds progressively like a story. So that with each new section different musical ideas are introduced.

#### TOMIE HAHN

Most of Japanese music is based on narrative. In other words, in Japanese music the text is primary for most pieces. And the clarity of the singing voices is very, very important. The narrative is actually a pathway through the music so in a sense the narrative is shaping the form. And this in contrast to many musical styles around the world where repetition of particular phrases is quite important. This is quite different from that. The text of the song Yugao is quite melancholy. Yugao is a woman in the tale of Genji and after Genji has an affair with Yugao she actually dies in his arms because of the vengeance of Lady Rokujo. "Holding a fan permeated

with faint scent of fragrant incense the owner of the house offers Genji a blossom of the evening faces glittering with pale dew. In a brief dream he is bound together with Yugao, a flower ever more beautiful. When he awakes he feels keenly the chilly winds of midnight." So in this poem there's such sadness, actually this is quite typical of many many Japanese songs.. They are about particularly a woman's sadness, deep deep sadness and it's expressed through nature. Even in contemporary pieces there is a drawing on the narrative and drawing on themes of nature so, a great example is a piece by Tadao Sawai called "Tori No Yo Ni" written in 1985. He says "How would it feel to fly free in the sky as a bird flies. Humans have invented airplanes but we are not free to feel the clouds as we pass through them." Mr. Sawai is composing a contemporary piece for Koto, a traditional instrument, but he continues the tradition of writing with some expression of nature and somewhat of a narrative.

#### NARRATOR

One of the most common vocal and instrumental forms found around the world is call and response. Call and response is both a structure and a way of performing. It relies on the regular alternation between soloist and chorus. In sub-Sahara Africa it is one of the main ways that vocal music is organized.

#### MICHAEL WIMBERLY

Call and response is the lifeblood of African people. And so, for example, when we play Kakilambe there was a call (sings) and we responded. And so, as you could see there is a lead person singing and we respond directly. So if you had to connect it to, perhaps, a Western sense of it, you would have section A stated and then section A repeated. In the ceremony for Kakilambe, call and response plays a very important part within the music. It's a harvesting dance. You're calling to Kakilambe for blessings.

#### JALAL SHARRIFF

Call and response goes back to the communal nature of African music. Traditionally in Africa there are truly no spectators, everybody's involved. So if somebody's starting a ceremony or singing a song, everybody answers. There's a call. It brings everybody into the ceremony, so that it ties the community together.

#### REV. DR. HENRY T. SIMMONS

Call and response--that is one of the common features of gospel music. It began with Africanisms that are part of our heritage.

ELMER HAMMOND, JR.

It bounces back and forth between the soloist and the choir and that helps to heighten the energy. It has a hypnotizing effect because it's something that is being done over and over again. And it gets the people caught up in what's being sung.

REV. DR. HENRY T. SIMMONS

You also would need to remember that when blacks were brought to this country as slaves we were not permitted to learn to read or to write. And we had always been a people of an oral tradition so one of the ways you make sure a message that is handed down orally takes root is you have to deal in redundancy. And so there's a sense in which call and response is rooted in the need to pass a vital message along.

ELMER HAMMOND, JR.

The leader is expressing an emotional vocaling and the choir or congregation is responding to that. It creates a sense of "Hey, I'm participating too, I can't sing in the choir but I can sing and I can participate in this as well."

NARRATOR

Musical forms often play an important role in dance and theatre traditions. In traditional Irish dance music the structure of the fiddle tune functions as a guide for both the dancers and musicians. While there are thousands of these tunes the majority fall into one single form.

JERRY O'SULLIVAN

With Irish music nearly all these pieces are composed of two major ideas. You'll have an A idea and a B idea and in actual performance what usually happens, the A idea is played twice through so you would go AA and then play the B idea twice, BB.

BRIAN CONWAY

There's no such thing as an Irish tune that only has an A part, or there's no such thing as an Irish tune that has an A part, three B parts, and one C part. Usually if one part's repeated they all are, with one or two exceptions. And that is the guiding force within Irish music.

JERRY O'SULLIVAN

It works very well with the dancing, when you either repeat an A or a B part or you switch from an A to a B part, the dancers also change what they're doing.



BRIAN CONWAY

It's fun to watch the dancers react to what you're doing. And the really good dancers, they'll react when you change keys in tunes, they'll react when you do little things in the tunes. And that's always fun.

JERRY O'SULLIVAN

I think it's worth taking the time and effort to think about the form and structure. Maybe you could use the analogy of seeing a very fine painting and that you know looking at it that it's something wonderful and something very special. But if you could actually see that artist put it together and watch all the stages, and watch it come to life, it means much much more. You see the skill and the artistry that goes into the whole process. It's really the same thing with music, if you do understand that structure you get a lot more out of the experience.

(CREDITS)

Exploring The World Of Music  
Program #11  
"Composers and Improvisors"  
Program Transcript

Narrator

There are as many ways to approach the creation of music as there are creative artists. The process falls on a continuum between improvisation, musical creation that takes place during performance. And composition, musical creation conceived before performance. Compositions are preserved, either through memory or notation, so that they can be repeated over and over again.

Stephen Leek

A composers role, I think, is to provide enough information to pass onto performers what they would like recreated in sound.

Simon Shaheen

The idea behind improvisation is to create an instant composition without preparing it or preconceive it as composition. It is , it's a composition that is being composed on the spot.

Jim DiSpirito

I think that composing and improvising are very closely related because they are both somehow the shaping of musical ideas. To me compositions though, represent a formalization of those ideas into a particular structure or a shape. Improvisation is also shaping of a musical idea but it is always somewhat free from having to do it the same twice or bringing other people in on it necessarily because it's your own personal expression.

Narrator

While most musical cultures have elements of both composition and improvisation the degree to which a performer may add to what is given by the composer varies significantly from culture to culture and genre to genre. In North Indian Classical music, performers work with a small amount of precomposed music. The bulk of the performance is improvised.

Buddhadev Das Gupta

A Raga has got only six or seven or eight basic phrases, each lasting for five seconds. Now if you are going to give a two hour recital what are you

going to do? Even that precomposed portion, the theme, that would possibly last for a minute at best, how are you going to fill in the rest of two hours? Improvisations and improvisations.

Narrator

Since the late 18th century composers of Western art music have left little room for improvisation. Instead they have relied on the score as a blueprint for performance. However, the interpretation of that score by the musicians is an essential element.

Timothy Ying

Even though you have that limited parameter there's an infinite variety in the number of ways that a given passage can be played. For instance, you can have the same passage of music and one person could play it very nobly and heroically. And another person could play that very same passage of music and bring out maybe the more thoughtful and reflective quality of it. And the interesting thing was both of those qualities were there in the music, but these two performances bring out different aspects of the same masterpiece.

Narrator

In the latter part of the 20th century many composers have experimented with elements of both composition and improvisation in their music. The Australian composer Stephen Leek works with voices and vocal techniques to create a rich tapestry of sound. While his compositions are notated, Leek often leaves room for a certain amount of improvisation during the performance. Nevertheless, his scores are crucial in providing direction and structure for the performers.

Stephen Leek

An example of perhaps the way I might manipulate some material or work with an idea is in Wirindji, which is the first movement of Great Southern Spirits, where I had a very simple little motif, which goes like this (plays). That's fairly traditional, fairly ordinary sort of motif or idea, and so when I started sort of playing around with it, I discovered I could do lots of different things to it to create some different sorts of colors. So the opening of Wirindji, for instance, starts like this (plays). There already we start to see the germination of the larger piece, the small idea (plays) and it goes on (continues playing) just repeating the same idea, the same idea but spread out over a couple of octaves (plays). I think a composer's role in passing on information which other people can interpret is to be as clear as possible. Sometimes there isn't the language for that to happen explicitly.

Sometimes you have to invent new symbols or something to suggest the sorts of sounds that you want. Because there are no finite symbols for every sound. Sometimes you have to create graphic scores or have a combination between standard notation and graphic. In interpreting the scores the performer is always open to some sort of interpretation. In Great Southern Spirits, for instance, the Kondalilla movement opens with the sopranos being given a boxed set of information that says "individually adlib repeat material, adlib" so a singer might come in alone with something like (sings). I've given the dynamics, I've given the articulation I've given the sound, I've given the pitch, but really the duration of the overall shape and form is up to the performer's discretion. I think that this sort of compositional involvement by the performers allows them to feel like they are actually contributing to the piece and in fact they have a sense of ownership of the work as well.

Narrator

Improvisation is a central ingredient in many musical traditions. This is certainly the case with Jazz. While the underlying form of jazz is based on composed works, in essence, to be a jazz musician means to be an improviser.

Joshua Redman

We improvise in every aspect of our lives, I'm improvising now when I'm talking to you because I don't know what I'm going to say before I say it. Improvisation is something which is basic to human life. In Jazz what you acquire to do is to play what you feel at the spur of the moment. But you are also required to improvise within certain contexts. You have to be aware of the written melody that you played, you have to be aware of the harmonic sequence. In most cases you're going to be improvising within and around that harmonic sequence. You have to be aware of the length of the song, of the form of the song because in most cases in Jazz you're going to be improvising around that form. Usually the prewritten part of the performance is very short relative to the whole performance. You begin by stating a melody which is over a sequence of harmonies and within a certain form. That will be in a sense, the composition. And after that you launch into improvisation. Jazz is a language that has been defined and refined over a period of about a hundred years. And anyone who is trying to be an improviser in Jazz has to be familiar with that language. The language consists of many different things. It consists of certain melodic fragments, melodies that every Jazz musician will know and can become familiar with. Charlie Parker, one of the most important improvisors in Jazz created melodies which were so strong and which influenced so many

people that they've become cliches of the language. For example, (plays), you would never want to play a whole improvisation with that, with that one idea, and in fact, most improvisations I play don't have that idea in them. But they may make reference in some way to that idea. The language of Jazz is not just melodic cliches, it's also the harmonies that we use in Jazz and the way the melodies that we use relate to the harmonies. For example, if I kind of outline a certain chord (plays), that chord wants to go somewhere else, it wants to go here (plays). Now if I'm going to improvise over those chords I'm going to try to create a melody which fits with those harmonies. So you have to have not only a knowledge of the language, a sensitivity to what everyone else is playing, but also a sense of where you are, where you've been, and where you're going. That's tough, it's hard, but it is also one of the most fulfilling and enriching forms of musical expression. And I think that is why most people who start playing Jazz don't stop.

Narrator

In Arabic classical music there are genres of composed repertoire as well as genres that are entirely improvised. Unlike improvisation in Jazz where performers are guided by a progression of chords, improvisation in Arabic music is completely melodic and is based on a system of scale types known as maqam.

Simon Shaheen

Improvisation, we call it in Arabic, Taqasim (\*\*horizontal accent over 2nd "a" and "i" in "taqasim") , and taqasim is one of the most important genres in Arabic music. It shows the knowledge, the experience, the abilities of the musician. Whether its a vocalist or an instrumentalist. When we play taqasim we have to make the main choice, which maqam I'm going to choose as my main mode in the improvisation. For example, if I use a maqam that is called rast, R-A-S-T, then this is the main maqam. I should start with this maqam and I can modulate to whatever I want, but at the end of the taqasim I have to go usually to the rast. The most important feature in taqasim is the ability to build up a melody and the more you modulate the more intense the improvisation becomes. The most important thing would be to understand that it has to be created on the spot. And it very much depends on the artistry and the knowledge, the experience of the musician. Now it is true that much of the ideas, the music ideas, with experience, they might repeat themselves but it's never the same, you can never hear an idea repeated twice the same. It could be close, but it's never the same. And the whole idea is to, maybe you repeat some ideas, but to

come up with some creative concepts that are very new and very maybe revolutionary also, musically speaking.

Narrator

All musicians are steeped in the musical language of their culture. And each composer has his or her own way of working with musical materials. But the actual process of creating music goes beyond the theoretical as artists bring their own inspiration to the task of shaping musical material.

Gerald Shapiro

Camille Saint-Saens (\*\* note: two dots as an accent over the "e" in Saens) said, "I write music the way apple trees grow apples." I wish that was true for me, it's not quite so easy. The process is always different. Sometimes I work with a synthesizer and a computer and I make a sequence and I actually make the music in sound like the way you make a pot, it's wonderful, it's like molding, it's like shaping, you know. Another time maybe I'm writing the notes on paper. I might try something at the piano, sit at my desk, write a little while, try something else, go back, write a little while. In either case, I don't think it matters too much. It's a kind of slowed down improvisation. One time I had a piece to do for a British vocal ensemble called Electric Phoenix, and I didn't know what I would do for them. I took a walk down along the waterfront, here in Providence, where I live. It was once beautiful, I mean, it's ruined now. It's like old dirty oil tanks and bits of trash etcetera. But underneath all of that overlay you could see the gorgeous shape of the land going down to the water and the water surrounding it. And you could see that it had been beautiful and it had been ruined. And it was this incredibly powerful image for me of that and required, it seemed to me, either just a scream of complaint or a prayer that somehow that damage could be unraveled. I found a text, Prayer for the Great Family, and commenced to work on that piece and wrote it very quickly. I think that what I'm writing is one long piece. And that I chop off a section of it and I give it out and every piece has something of the material that came before it. Every piece is an intersection. I live a life. I have children, I have parents, a wife, each piece is an intersection. There's a technical study that's going on. I'm learning all the time. And I'm living a life and I'm learning all the time what's in my heart, you know, what's in the world around me. And each piece represents a special intersection between those two things.

Narrator

In rock and roll both composition and improvisation are important components of performance. And these processes involve the whole band. While the song may be composed initially by one band member often the rest of the group will have a role in shaping the piece for performance.

Mike Glabicki

I often feel I'm being led to a song as opposed to creating a song. I compose on acoustic guitar, it's my medium. Just like oils or watercolors. To me I'm lucky because I'm living in the '90s where I can throw a tape recorder on and record whatever just came through me, and listen back to it later on and decide what do I want to piece together, you know, make a song. After you receive something you want to go with, at that point, that's where the struggle comes in because it becomes even harder at that point to have somebody sitting in front of you and still remain unattached from it. Because I continue at that point to bring it into the world, to birth it. As you raise a child, it's not just the parents that raise the child. It's the community around the child. So I'm always open to being shown ways to help that song grow. That's bringing it to the band.

Jim DiSpirito

Michael brings a musical idea to the group and everybody sort of puts their twist on it. Maybe the groove should move a little over here, or maybe we should put a section in here that emphasizes this, or maybe we should end it this way. Somehow everybody gets involved in the process of trying to help shape this musical entity.

(talking to each other during rehearsal) "Trying to think of something right now ... and then come back out into the new base part."

"You were supposed to switch, whenever I start singing again, just like we do in the first verse"

"Yeah, I did because I, you know, spaced it a little bit, like I was trying to think of something to go into there,"

"Right"

"And then I went into it and still it didn't feel right..."

John Buynak

It always reminds me of the Stone Soup story where you have a pot in the middle of town with nothing but boiling water and everybody is asked to

bring what they have to the center. So I think that process is very, a very communal way to approach a piece of music.

Jim Donovan

There's so many different little processes that go on because there's going to be vocal harmonies, there's going to be vocal inflections, there's how the rhythm sections work together, the drums, the percussion, the bass and the drums, how the guitars work together. It's really complex but a lot of times, if you listen to a song and you pick apart each part, you realize that there's no one part that is just incredibly complex. They're all real simple parts, all put together, weaved together to make this thing that sounds really complex but in its essence it's really simple.

Liz Berlin

The live performance, that's the place where we get to sort of try it out on people and see how it works. The parts really take on a new depth to them.

Michael Glabicki

The audience gives to this. You can visualize it as a tree. Back to when I receive a seed of it, I bring it until it's about this big, you know, and I present it to the band, and then we work on the foundation of it. Then when you perform it, it starts to change all different seasons, and change colors and then it gets much bigger. Then you truly realize that there's something bigger happening, it's not your song anymore, it's gone.

CREDIT ROLL



## Exploring The World Of Music

### Program #12

#### "Music and Technology"

#### Program Transcript

Narrator:

Music and technology have always been closely intertwined. As instrument production, sound recording, and the means of distribution have changed, so has the world's music.

Mark Slobin:

Technology has become quite decisive for world music making since the advent of the industrial age in a few key ways. One is the creation of new instrument types that simply couldn't be built before. The modern piano depends on high steel techniques that just simply weren't available until a certain point in the nineteenth century. Instruments like the modern saxophone, the modern flute, these are all high tech in a nineteenth century way. Another way in which technology has become decisive is in the invention of sound reproduction. It simply was the case that before about 1890 music vanished onto the air. You had to remember the way somebody played something that you heard once in your life because you would never hear that again. Once you could reproduce that sound you could stock pile it because of the technology of reproduction. This is a profound and deep ranging change that happened to music after a million years of human existence.

Gerald Shapiro:

The invention of the vacuum tube came early in the century. Radio came along and music was delivered to a much different and wider audience and everything changed. But that wasn't the first time. As soon as you move from just singing to making instruments you're involved in technology. I just saw this article about this bone flute from years ago, the archaeologist said, "Boy, we didn't think people were making anything back then." And yet one of the very first technological advances was this bone flute. That flute was made at the very limits of the available technology for these very very primitive humanoids. And for millennia, instruments, and until the present day, really, instruments were and remain often and in some ways at the forefront of the technology.

Narration:

The flute is one of the world's oldest musical instruments. Over time, its construction, play-ability, and sound have been determined by the technology available to instrument makers. Flute production has been and continues to be a marriage of sorts. A marriage of artistry and technology.

Steven Wassar:

The flute is really a very simple instrument. What makes it different from other woodwind instruments, like a recorder, is that instead of blowing down the instrument you're actually blowing transversely. You're blowing across the embouchure hole just the way you would blow across a soda bottle.

Mike Greer:

In the early 19th century, late 18th century, flutes were very simple, they had one key or two keys if any and they were hard to play in tune with themselves or with anyone else in a small orchestra and consequently they had a reputation for being whistle-like and not real sonorous or real colorful.

Peter Standaart:

This is the most simplistic of what we call the transverse flutes and it just has the six finger holes and the one key for the pinky. The natural scale on the baroque flute is basically the position of the six fingers and the six holes so that if you lift up your fingers in order you get what we call a major scale. (plays) So when you were playing in pieces that required notes that weren't in that particular scale you had to like make adjustments by rolling in to make it flatter or close more holes down and it was a very sort of awkward thing so if you tried to play a chromatic scale it would get like this (plays). So that's when they developed of adding more keys to the flute. This flute's pretty much what was developed around Mozart's time, about 4 or 5 keys. (plays)

Mike Greer:

Mozart hated the sound of the flute but realized that it was so popular that it should be in an orchestra. What he hated about it was that it was not in tune with other members of the orchestra and consequently sounded awful, as he put it. But he wrote for it and he wrote very well for it. Theobald Boehm back in 1850 came up with what we call the modern day flute key system, but we seem to try and improve on what's been done for 140 years.

Steve Finley:

Flute production has changed dramatically. Mostly through mechanical and technological improvements digitally. And a lot of the machining has

changed dramatically, more specifically through tolerances of 1 thousandths of an inch, which the thickness of a cigarette paper. And if it's off that much flutists can hear it. We have machinery, we have computerized machinery, we essentially work with metal, we're metal workers. We melt it, we machine it, we cut it, there's all kinds of things that we do to metal here and to do most of those functions you need tools and equipment.

Mike Greer:

Technology is the science of what if. I think of it as something that we can't do without because our minds are curious and something that if we did without it we'd still be starting fire with stones. And the human mind wants more than that. And we want to better ourselves. And sometimes we better ourselves and sometimes we miss.

Steven Wassar:

The pads are a very critical part of the flute and have a major impact on the responsiveness and the acoustical qualities of the instrument. In the case of a piccolo the pads traditionally are made of felt and about 7 to 10 years ago I came up with the idea to design a special silicone pad which actually has a hollow or baffle system inside. One of the advantages of using silicone is that it can truly seal the tone hole. What we discovered however is that the mechanical perfection of this pad was in conflict with the artist's desire to control his sound. What was happening was that a felt pad is in some ways so bad that when you open and close a pad you don't get an on off yes no, there's a lot of gray area in between. That makes transitions between notes appear to be very smooth so that you have an imperfection in the pad actually enhancing the artistic quality of the instrument. And what we did to deal with this problem was to actually sandblast the mold to roughen the surface of the silicone to create infinitesimal little leaks. As a result of creating these leaks in the pad we were able to partially satisfy the artist's desire to have more gray area and to allow for smooth transitions.

Frederick Stubbs:

The evolution of precision technologies has made a kind of standard possible whereby you can go to Duluth or to Paris and find the same A440 on the instrument that you are playing. And this kind of standardization has led to the sharing of more music, the playing of more varied instrumentalists together. But a musical instrument can be made of something extremely simple and still have the power of profound expression. It seems to only be true in the European or American world that people look on instruments as a manufactured item. Elsewhere in the

world the kind of spiritual aspect to an instrument is much more important. Instrumentalists treat their instruments very very carefully. In many societies, libations and ceremonies are prepared as the instrument is being built and as it is being completed. There's a kind of soul in each instrument that is the responsibility of the musician to seek out. Because the instrument is an object, but it is not the object. Music is always the object of the instrument.

Narration:

Technology has always had a fundamental impact on the construction of musical instruments. In the past hundred years it has also influenced what music we hear and how we hear it. In 1877 Thomas Edison designed the first machine capable of reproducing sound and the process of acoustic recording was born.

Jerry Fabris:

The very first phonograph used tinfoil as a recording medium. At the time he was working on improving Alexander Graham Bell's telephone and was also trying to develop a recording telegraph so he put these two ideas together in his mind and made essentially a recording telephone. If you were to walk into a recording studio in Edison's era, there'd be no microphones. Instead of a microphone what was used was known as an acoustical horn or a recording horn. That was what captured the sound and transferred the soundwaves onto the master record. As the singers sang or a band played, the air in the room would vibrate and an acoustical recording horn would collect the soundwaves and these would be transferred through sound pressure down onto a cutting stylus which cut the sound pressure waves into the record. Musicians really had to play for the recording equipment so you would set up the recording equipment and then the musicians would gather around the recording horn and for example if someone had a solo they would move up closer to the horn and if they were not doing a solo they would have to move away from the horn. The main limitation was, it took loud sounds to cut into the record and for example instruments like an acoustic guitar or a violin were very difficult to record. One way around that was at the turn of the century for a few years a lot of the recording studios, Edison included, used what was known as a stroh violin which was designed in England. It used a phonograph diaphragm and a phonograph horn so it essentially made a violin into a horned instrument.

Jerry O'Sullivan:

Like anything else technology can be used very badly or it can be used very well. One of the negative things connected with technology has been in the

homogenization of playing styles within Ireland and for that matter the rest of the world where Irish music is played. Prior to the radio and the phonograph, learning music was done very very locally. Keep in mind that going back only 100 years ago or so that most people never got beyond their little village. And you could tell where somebody was from just by listening to them play. You wouldn't even have to hear them speak. Starting in the 1920's there were a number of players who were recorded in this country. Michael Coleman, probably the most influential Irish musician of the 20th century. The old wax cylinders and 78's that he made here in New York, they traveled back to Ireland and they changed fiddle playing style. People tried to imitate Coleman whether they were from Sligo or whether they're from Cork or Donnegal. It no longer was the case that you could tell where somebody was from by listening to them. That was the beginning, that this was starting to be homogenized. In a positive way technology has helped this music in that there's an awful lot of recordings of very good music out there. So it's brought it to a wider listening public.

Rave Tesar:

Very very early days, some phonograph recordings were cut right to wax, they'd stand in the room and the cutting lathe would cut the original master right into wax, which by the way had to be very soft, so it had to be very hot. So a lot of the old time musicians will tell stories about the early days of recording like almost stripping down in their underwear and going in this room and recording for three minutes. It's 130 degrees in this little room because it's got to be hot enough for the wax to be soft enough for the lathe to cut it and everything was done live right there. Certainly things are pretty easy, we've got air conditioned studios now and this instrument doesn't even need a microphone, the sound is coming out of a wire and going directly to the tape recorder.

Bill Tesar:

With the advent of multi-track recording you can actually record yourself several times on one piece of tape without erasing what you've already done.

Rave Tesar:

Each person is recording on a different line on that tape. So the tape recorder is recording me on let's say not the whole 2 inch width of the tape, but maybe an eighth of an inch. And someone else gets the next eighth of an inch. You can see what we call the meter bridge and actually see all the sounds of the individual musicians when they're playing, when they're not playing. Let's just say the band plays a five minute piece of

music and everybody loves what they played. Oh, it was just so perfect. But one person just made one dumb mistake and played something and missed a note or their finger slipped and they hit something they didn't want. And it was just one note. We have the ability for that person to play, let's for example just say that they meant to play this (plays) and they played (plays). Well the tape recorder can actually go back, after the fact, and do what we call a punch in and a punch out or an edit.

"Was that a punch or was that another rehearsal?"

"That was just rehearse"

"All right, let's just, let's do that and we'll be fine, let's make that edit"

Now what will happen is before it goes into record it'll just be playing back (plays) that person's performance. The minute it goes into record it will start with what they're now playing, so what we would need to do is go back and play what we had played originally minus the mistake.

"Okay, I think that was it, did you get that?"

"yeah"

"cool."

Mark Bernstein:

Technology has really enabled the bass to come out. The bass has traditionally been a really supportive instrument. If you listen to any old records, you can hardly hear the bass player at all. With the advent of the electric bass and then the bass became much more a force. The bass line has just become much more a part of what the average listener hears. Of course it's a double edged thing as far as with anything technology in the studio gives you the possibility of making something perfect, theoretically, and so it has created a whole new art form. Making a record and playing live are two different things. I think that's the first thing I had to learn as a musician. In the studio you have to learn to create in a different environment without the energy of the audience, without the energy of necessarily even the live performance. But you're still creating the music. The challenge for the Jazz musician is to be able to maintain the live feeling.

Rave Tesar:

There is a universal code or language that many musical instruments operate on, MIDI, musical instrument digital interface, M-I-D-I-. By having a universal code like MIDI, I have the ability of playing this keyboard and controlling sounds from maybe other sound sources, or even other keyboards. Many of the different sounds that I played on this

instrument really come from what's called a sampling technology. At one point there was a microphone stuck inside a real piano and a recording of that instrument was made, converted into a digital code, and through the MIDI language, is played back on this instrument.

"At the risk of sounding greedy I'd actually like to layer another part on top of that..."

Of course sampling technology does open up somewhat of a Pandora's box for musicians. Now if I can play the sound of violins maybe I don't have to have a string section anymore. So to some degree it has changed, it's the cotton gin so to speak, it's changed the nature of the way music is being made. I liken the whole studio experience to playing an instrument itself. Look, every musical instrument is just some kind of a contraption anyway and in many ways the tape recorder is almost become like another musical instrument. It really makes each individual musician kind of like a conductor, a composer, an arranger. It affords each individual musician the ability to do all those things. So it almost brings us back 500 years to the days of the wandering minstrel where like somebody had to write their own tune, walk from village to village, play whatever instrument they could, and they were the whole show.

Gerald Shapiro:

I graduated from high school in 1960 and I didn't have a tape recorder. I had no technology. An electronic music studio was oscillators taken from the physics lab. There was nothing like a synthesizer made for musicians. Here behind me, here's an Arb synthesizer, how many of those were made? Three, four hundred, maybe a thousand of this big model. It was made for composers, it was invented by composers, right? Here in front of me, here's a Kurtzweil synthesizer. Hundreds of thousands of these are made. It's made for consumers. And of course, the synthesis got linked to computing. One way of making a piece is to make the piece on a synthesizer and record as you go on the computer. No notation, playing, playing. I like this. I don't like that. Try it again. Record again on the computer as a sequence. Little by little I began to realize that the music that I wrote was very shaped by the technology I was using to write it. The process became sort of passive. Way more listening, and way less writing, it was slowed down, and I was losing track of the shaping of it. So I switched over to paper and pencil again. And then after a while I switched back again. And after a while it began to seem that I could work either way interchangeably. All instruments have developed technologically, and it slowly slowly changes. The important thing to remember is it doesn't get better. Technology gets better but the music of the Middle Ages is as

compelling, is as good as the music of the 20th century, and I know some would say better. There's no progress in music or in any of the arts but there is change and that change is certainly driven as much as anything by changes in technology.

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