

ROOTS OF RHYTHM: EXTENSIONS
CHAPTER 5: THE TURNTABLE FROM THE UNITED STATES

Instrument:

Turntable, an urban, electric friction idiophone

Country:

United States



Flag:

There are 13 equal horizontal stripes of red alternating with white and a blue rectangle in the upper left-hand corner with 50 white, five-pointed stars. The 50 stars represent the 50 states, and the 13 stripes represent the 13 original colonies. The flag's design and colors, known as Old Glory, have been the basis for a number of other flags, including Chile, Liberia, Malaysia, and Puerto Rico. This version of the flag was adopted July 4, 1960.



Size and Population:

The United States, including the 50 states and the District of Columbia, has an area of 3,618,770 square miles with 12,383 miles of coastline. It is about half the size of Russia, about three-tenths the size of Africa, and is slightly larger than Brazil. The U.S. is the world's third-largest country by size after Russia and Canada. Mt. McKinley in Alaska at 20,320 feet is the highest point in North America and Death Valley at 282 feet below sea level is the lowest point on the continent. It borders two nations Canada (including Alaska) and Mexico. As of July 2005, the estimated population of the United States is 295,734,134. It has the world's third largest population after China and India.

Geography and Climate:

Excluding Alaska and Hawaii, the United States borders the North Atlantic Ocean on the east and the North Pacific Ocean on the west, and has seven geographic regions.

1. The Appalachian Highlands have many rugged mountain ranges beginning in the northern tip of Maine and extending south to Alabama. The Blue Ridge Mountains are some of America's oldest.
2. The Coastal Lowlands begin in southeastern Maine and extend southeast to Texas. Along the Gulf Coast there are rich soil deposits from the Mississippi River and other rivers that create fertile farmlands.

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3. Interior Plains Region, the largest geographical area, consists mainly of an area carved by glaciers during the Ice Age. The effect was to strip topsoil and deposit it southward, and gouge out many lakes, including the five northern Great Lakes.
4. The Ozark-Ouachita Highlands is a small region of rugged terrain with deep gorges, forested hills, and fertile land along river valleys located mostly in Missouri, Arkansas, and Oklahoma.
5. Rocky Mountains, the largest mountain system in the U.S., cover a continuous range from northern Alaska to northern New Mexico. Here there are many peaks over 14,000 feet high, and the Continental Divide, an imaginary line that separates water flow to the east and west.
6. The Western Plateaus, Basins and Ranges are west of the Rocky Mountains, extending south from Washington to the Mexican border. The Columbia Plateau in the region includes the spectacular Grand Canyon and some of the nation's most unusual land formations. The Basins and Ranges regions include Death Valley and the Great Salt Lake.
7. The Pacific Ranges and Lowlands Region occupies western Washington and Oregon, and most of California. On the east are the northern Cascade Mountains, home of two active volcanoes, and the southern Sierra Nevada Mountains, a range made almost entirely of granite. West of these areas are wide fertile valleys and the Coastal Ranges that include the San Andreas Fault, a break in the earth's crust that causes occasional earthquakes.

Alaska has rugged mountains and broad river valleys and Hawaii has mainly a volcanic topography.

The climate in the U.S. is mostly temperate, but tropical in Hawaii and Florida and arctic in Alaska. West of the Mississippi River the Great Plains are semiarid while the Great Basin in the southwest is arid. Low temperatures during winters in the northwest are warmed occasionally by winds in January and February from the Rocky Mountains. Natural disasters include hurricanes and flooding along the Atlantic and Gulf of Mexico coasts, tornadoes in the mid west and southeast, mud slides in California, and forest fires across the west. The average annual temperatures range from 9° F. in Barrow, Alaska to 78.2° F. in Death Valley, California. Annual rainfall varies from 2 inches in Death Valley to 460 inches in Hawaii.

Background and History:

Since the turntable is the only electric percussion instrument in the Roots of Rhythm, this section will focus on the background and history of electricity, sound recording and playback as it developed first in other countries and then in the United States. These discoveries and inventions along with American population growth and urbanization led to the use of the turntable as a musical instrument.

Around 1600, early experiments with electricity by Englishman, Dr. William Gilbert showed that amber and magnets interacted. He was the first to use the word "electric" and his studies proved to be pioneering work for later developments in electricity. An English scientist, Stephen Gray, in 1729, discovered that some substances conducted electricity while others did not. In 1752, Benjamin Franklin proved that lightning and the spark from rubbing amber was one and the same thing with his famous and dangerous kite experiment. *(The first British settlement of Jamestown had about 100 colonists in 1607, but by 1753, the mostly rural colonies had a total population growth to 1,328,000.)*

The music box, invented by Antoine Favre in Geneva in 1796, could play music mechanically. In 1806, Thomas Young in Britain recorded a tuning fork on a rotating wax drum, but there was no way to play it back. Around this time, Alessandro Volta showed that electricity could travel from one place to another by wire. *(By 1783, the U.S. population was 3,125,000 with 4 percent living in the cities.)*

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Important technological developments in electricity between 1820 and 1849 included the first successful telegraph, thus beginning mass communication through electricity. In 1827, the German teacher, Gerog Ohm, worked out the law of electrical resistance. By 1831, the English scientist, Michael Faraday found the first method of generating electricity by means of motion in a magnetic field, the first electric generator. In 1857, the phonoautograph, developed by French researcher Leon Scott de Martinville, used a horn to record sound vibrations as a wavy line on a sooty surface. *(During this period, the U.S. population had over tripled to 22,488,000, and urban dwellers had risen to 15 percent.)*

Advances in electricity between 1870 and 1916 included the invention of the telephone in 1876 and the electric light in 1878. The phonograph's invention by Thomas Edison in 1877 was significant because it developed into the electric phonograph and later into the turntable, the subject of this chapter. This first phonograph, powered by a hand-cranked spring, recorded sound on a small metal cylinder and played it back. This same year, the loudspeaker was invented in Germany, but was not yet operated by electricity. In 1885, wax cylinders replaced the metal ones, and two years later, Edison's new Gramophone used shellac discs. Recently, the Library of Congress recognized that three cylinders, the Edison Exhibition Recordings of 1888-1889, were the birth of commercial sound recording. *(The U.S. population in 1864 had grown to 38,925,000 with 25 percent living in the cities.)*

In the 1880s, scientists found that electrons are part of atoms, and invented vacuum tubes showing that electrons could be dislodged from atoms. This led to invention of the radio and television in the following decades. In 1887, Edison updated the phonograph with solid wax cylinders and a battery driven electric motor to give a constant pitch, but the cylinders could record only 2-4 minutes of music. This same year the player piano was invented, which was later considered to be the forerunner of the 1927 jukebox. Italian Guglielmo Marconi invented the radio, a spark transmitter with antenna in 1894, and in 1898, Danish scientist Valdemar Poulsen built the first tape recorder. The first electronic amplifier is made by Lee DeForest in 1911.

The first electrically recorded phonograph discs appeared in 1925, and by this time phonographs used electric motors and amplifiers, improving the quality of sound. Charles Brush sold the first piezo-electric stylus in 1926 and eventually this type of phonograph was used to play recordings of jazz, ragtime and opera that turned at 78 rpm. *(By 1920, almost half of the U.S. population of 100,000,000 lived in the cities.)*

Other 20th Century inventions in sound reproduction included magnetic tape in the 1930s, the transistor in 1947 and the vinyl (Polyvinyl Chloride) long-play 33 1/3 rpm record in 1948; followed soon after by the 45 rpm record. In the 1940s the first DJs emerged as entertainers for troops overseas, and by 1949 in Jamaica, large sound systems were developed for playing 45 rpm recordings. Radio DJ Alan Freed's successful radio program, "Moondog Rock and Roll Party" in 1952 introduced black urban music to mainstream white teenagers. Single channel monaural records began to give way to two-channel, high-fidelity stereophonic records, and loudspeakers enclosed in boxes which become the standard in 1958. Crystal cartridges changed to stereo moving magnets between 1933 and 1955.

The art and technology of sound reproduction was rapidly changing during the 1960s. In 1963, the first audio cassette was developed by the Phillips Company. New musical sounds and sampling became available on the synthesizer invented by Charles Moog in 1965, and by the late 1960s all new phonographs and records were stereophonic with the rapidly expanding record industry making use of

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advances in electronic technology. Also in the 1960s, scientists discovered a way to integrate many transistors on a single silicon crystal. These complete electronic circuits, or integrated circuits, led to the development of the microprocessor, which in turn led to the development of the home computer and home recording.

In the 1970s digital recording was developed by an American engineer, Thomas Stockton, and this led to the introduction of compact discs and players in 1983. Electronic percussion devices were invented around 1980 by Englishmen Dave Simmons (electronic drumset) and Roger Linn (studio drum machine). From the late 1950s onward diamond styluses became the standard. (*Today, the U.S. population is 295,734,134, and over 75 percent live in the cities.*)

These collective technological developments over the past 150 years in the U.S. and other countries have evolved in the context of American culture, and provide background for a discussion of the popular culture known as hip-hop.

Culture:

The United States has one of the world's most varied national cultures. As a land of immigrants, almost every major culture is represented in the population. While America is often referred to as a "melting pot" of cultures, many citizens take pride in their origins, preserving traditions of clothing, food, arts and language. In many urban areas, there are separate neighborhoods of particular ethnic groups that celebrate their heritage with festivals, parades and other cultural events.

America's diversity can be seen in its population, religions, language and food. The population of the United States is 81.7 percent white (including 9 percent Hispanic), 12.9 percent black, 4.2 percent Asian, 1 percent Amerindian and Alaska native, 0.2 native Hawaiian and other Pacific islander (2003 estimate). While urban areas cover less than 2 percent of the land, over 75 percent of the population lives in the cities. Religious affiliations included 52 percent Protestant, 24 percent Roman Catholic, 2 percent Mormon, 1 percent Jewish, 1 percent Muslim, 10 percent other, and 10 percent do not record a religious preference (2002 estimate). While there is no official American language, English is spoken by 82.1 percent, Spanish by 10.7 per cent, Indo-European by 3.8 per cent, Asian and Pacific island by 2.7 percent and others represent .7 percent (2000 estimate). The variety of available food types also reflects the America's growing diversity in urban centers and to lesser degree in rural areas.

Americans have one of the best education systems in the world and a diverse arts community. There are over 74,000 elementary schools, 25,000 high schools, 6,800 combined elementary and high schools, and 3,300 colleges, universities, and community colleges. Over 97 percent of the population is literate. American artworks include the colonial portraits of John Copley, cowboy paintings of Charles Russell, Kachina dolls of Hopi Indians, abstract paintings of Jackson Pollack, and the architecture of Frank Lloyd Wright.

Art and recreation in urban centers, especially for youths in the late 1960s and early 1970s, saw the growth of disco nightclubs and with them the use of recorded music being preferred over live musicians. Disc jockey's at this time, made use of the considerable amount of popular music that had been recorded and those recordings were preferred over renditions by local musicians. This became the setting for the use of turntables as a musical instrument, called "DJing" and "turntablism" within the youth arts movement called "hip-hop."

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The Roots of Hip-Hop Culture:

Hip-hop DJs trace their roots to black DJ personalities of the 1950s and 1960s who would "talk through" or talk over the music being played in the studio to a radio audience. The "mobile" or "street" DJs of the 1970s, however, were outdoors with make-shift sound systems and played to a local live audience. DJing is considered the first of the four expressions of hip-hop culture that also include MCing (rapping), b-boying (break dancing) and graffiti art. Developed in the early 1970s in the Bronx area of New York City, DJing became the musical soul of street dance parties, events in parks and community centers. It is important to remember that this unique, artistic expression grew out of a condemned community, the South Bronx, that had become a national symbol of urban blight. Given little or no assistance to recover from abject poverty, urban youths created their own art and community outside of the mainstream. Youths would hook up an improvised turntable and sound system to electricity from a streetlamp outside a school or an abandoned building, and with makeshift parts create their own visual art (graffiti), dance (break dance), and song form (rapping) to a local DJs music. Several DJs emerged as pioneers, inventing many of today's established turntable techniques.

Jamaican-born Clive Campbell known as Kool Herc, considered the first major innovative DJ, used a very large sound system and relatively unknown records. Also, instead of just talking to the crowd he would recite rhymes while mixing and would add electronic effects. Adapting techniques from DJs in his native Jamaica, he was the first to use two turntables to continue a short percussion solo on a record called a "break" dovetailing or "mixing" back and forth between two identical records with the audio mixer. This was particularly enjoyed by certain dancers during the breaks who became known as "break dancers," "break boys" or "b-boys."

This technique, also called "cutting" was perfected by Joseph Saddler, known as Grand Master Flash. Along with a cueing system with headphones, he was able to find an exact groove on a record. Most importantly, Saddler was the first to record scratching, the art of moving a record back and forth with the needle on the record, on his 1981 recording, *Adventures of Grand Master Flash on the Wheels of Steel*. This was the first recording of the turntable as a musical instrument. With his group the "Furious Five," Saddler recorded "The Message" in 1982, a pivotal rap because of its focus on urban social issues. In 2002 this recording was chosen to be included in the Library of Congress.

Afrika Bambaataa Aasim, also known as the "Godfather of Hip-Hop," had a wide influence on DJs particularly with his diverse choices of records that he mixed. He pioneered the fusion of synthesized techno-pop with the funk styles, for example, in his computer synthesized "Planet Rock" in 1982. Grand Wizard Theodore learned from these older DJs and mastered the art of repeating breaks, expanding the technique of scratching. Grand Mixer DXT studied these techniques and was a featured DJ during a performance of Herbie Hancock's "Rockit" on TV which brought the technique of scratching to a much larger audience.

World-wide competitions in the mid-1990s through the International Turntablist Federation, provided a way for new artists to advance the art form. The innovations of DJ Kool Herc, Grand Master Flash, Afrika Bambaataa, and Grand Wizard Theodore along with many others transformed the use of turntables into an art form that is now taught in schools and colleges around the United States.

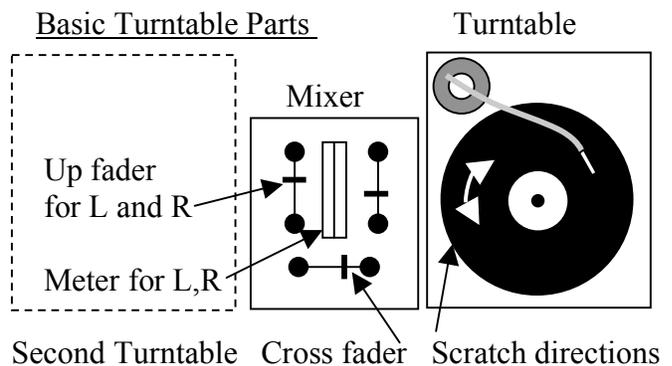
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Music: Instruments & Rhythms

Instruments: The musical instruments in traditional American culture include brass (trumpets and trombones), woodwinds (clarinets and flutes), strings (violin and viola), and percussion (cymbals, kettledrums, xylophones, and a variety of drums). Electronic musical instruments invented in the 1800s and developed in the 20th century including the synthesizer, electric guitars and, over the past fifty years, the turntables used in hip-hop for scratching. Along with the development of the turntable as a musical instrument, the mixer has developed as a separate unit that controls the all aspects of sound for both turntables.

First used to play phonograph records, this electronic equipment has become a tool for creating music, by precise control of forward and reverse movement of the needle in the grooves of a record and manipulation of the mixer's volume, tone, and fader controls. The boombox, a large portable stereo radio/cassette player/recorder, was common on the streets in urban areas beginning in the early 1970s and provided an battery-operated mobile rhythm section as background for break-dancers, MCs and graffiti artists. Along with this came the technique of "beat boxing," or using mouth sounds to imitate the sound of a rock drum set, often amplified with a microphone and sound system.

One turntable consists of several parts: the *platen* that supports the record, the *electro-mechanical system* that turns the platen at an exact speed, the *arm* that holds the needle in the correct position, the *needle or stylus* that picks up the vibration from the record, and the *electronic system* that amplifies the signal from the needle. The mixer controls the loudness of the turntable so that two turntables can be used, left (L) and right (R).



Rhythms: Rhythms on the turntable are created by a wide variety of techniques. The most basic is the scratch, a manual movement of the record when the turntable's motor and amplification are turned on. The record slips on a thin disc of plastic placed between the record on the platen. A second technique is using the fader or volume knob to control the loudness of a particular section as the record is moving. The third technique is a combination of the first two and requires considerable dexterity and coordination. Rhythms get increasingly complex when two records are used and mixed simultaneously.

There are dozens of scratching techniques all with their own rhythms. At times a quick motion will result in the vocalization "wow," a baby cry or a scared cat sound. Slow motions of the record will give a low growl sound or bass drum sound hit while fast motions give a high-pitched screech or snare drum hit. In most hip-hop music there are four counts with an accent on two and four, and at times two, three or four subdivisions on each count. Counts one and three are often bass sounds and two and four are treble sounds. Syncopations or accents off of a count might fall on the second beat of a two beat subdivision, for example, counting 1, 2, 3, 4 and resting on count 4.

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Listen & Play Along:

Note to teachers: if instruments are not readily available, consider having students make their own (a specific turntable-making activity can be found in the next section) or encourage them to improvise

using everyday items that have a bumpy, textured surface such as sandpaper, book covers, plastic take-home containers, etc., as instruments. Rhythms can also be created with body percussion including hand clapping, foot tapping, finger snapping, and mouth sounds used in "beat box."

Listen to Tracks 59-64 of the Roots of Rhythm: Extensions Companion CD to hear the sound of the turntables. Now it's time to play the turntable! Play your homemade turntable along with the musical example on Tracks 65-73 of the Roots of Rhythm: Extensions Companion CD.

Make Your Own Turntable: Use a plastic take-home container that has a bumpy, textured surface, and scratch that area with your finger nails or finger tips to get a friction sound like the turntable. Use the volume and tone control with a CD player turned on to practice the fader techniques, and the speaker cover to practice your scratching.

Plastic take-home tray



CD player volume and speaker



Turntable and Performers:

Turntable (right) and Mixer (left)



MC Ace Boogie (center)



DJ Simplee (left) and DJ Drama (right)

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Resources: Turntable Playing Techniques and Rhythms

Turntable Playing Techniques & Notation

- Basic scratch is a push forward – an up arrow  and a pull backward – a down arrow 
- Soft scratching is a short motion – a short thin arrow 
- Loud scratching is a long motion quick – a long thick arrow 
- Fader technique using a CD player's volume control and tuned to noise between stations, make a burst of sound from soft to loud to soft quickly – an arrow in an inverted V 
- Low pitch – is a slow drag across the surface – an angled arrow 
- High pitch – is a fast, long motion – a long arrow 

Turntable Rhythms

The turntable rhythms below can have one, two or three beats per count.



A dot means to rest on one of the double beats.  An empty box means rest for one count.

1. Basic scratch

Count	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
Say	up	down	up	down	up	down	up	down	up	down	up	down	up	down	up	down	
																	

2. Basic scratch – with syncopation

Count	1	2	3	4an	1	2	3	4	1	2	3	4an	1	2	an	3	4
Say	syn	co	pate	rhy-thm	rhy	thm	syn	co	pate	rhy-thm	syn-co-pate	syn-co-pate	syn-co-pate	syn-co-pate	syn-co-pate	syn-co-pate	syn-co-pate
																	

3. Fills – getting louder and softer

Count	1	2	3	4	1 an	2 an	3 an	4 an	1	2	3	4	1 an	2 an	3 an	4 an
Say					softest	louder	louder	loudest					loudest	softer	softer	softest
																

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4. Fader technique – use the CD player's volume control

Count	1	2	3	4	1an	2an	3an	4an	1	2	3an	4	1an	2	3an	4
Say	fade	fade	fade	fade	fa-der	fa-der	fa-der	fa-der	fade	fade	fa-der	fade	fa-der	fade	fa-der	

5. Stab

Count	1	2	3	4	1an	2	3	4	1an	2	3an	4	1	2	3an	4
Say	stab	stab	stab	stab	re-cord				stab	re-cord	stab	re-cord	stab	stab		re-cord

6. Scratching – with continuous 8th notes

Count	1an	2an	3	4	1an	2an	3	4	1an	2	3an	4	1an	2	3an	4
Say	dou-ble	dou-ble			dou-ble	dou-ble			dou-ble		dou-ble		dou-ble		dou-ble	

7. Drags

Count	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
Say	dra	-g	scratch		dra	-g	scratch									

8. The Transformer – slow drag of record with quick fader

Count	1an	2an	3an	4an	1ea	2ea	3ea	4	1an	2an	3an	4an	1ea	2ea	3ea	4
Say	T F	T F	T F	T F	TFM	TFM	TFM	scratch	T F	T F	T F	T F	TFM	TFM	TFM	scratch

T F = "trans-form" TFM = "trans-for-mer"

9. Crab

Count	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Say	pinky	ring	middle	index					pinky	ring	middle	index				

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Extensions:

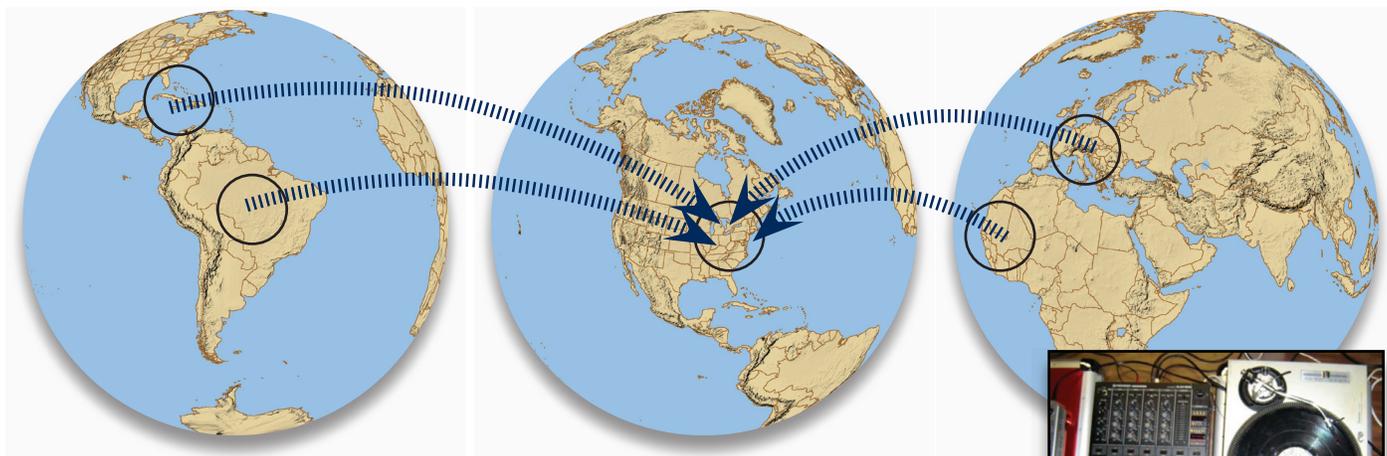
At first glance, the Turntable might seem to be an unusual choice for inclusion in this presentation of world percussion instruments. However, as a friction idiophone, the Turntable represents a valuable addition to the family of global percussion and the *Roots of Rhythm* program. Combining common playing techniques with advanced electronic technology, the instrument has spread in popularity and become recognized as a valid means of artistic expression; making it an ideal example of how the world's drums and drumming styles continue to influence one another and evolve to create new kinds of percussion instruments for new types of music.

Musical Influences		
Root	Influence	Extension
<i>Buhai/Romania</i>	friction drum	Turntable/U.S.A.
<i>Cuica/Brazil</i>	friction drum	Turntable/U.S.A.
<i>Dondo/Ghana</i>	variable pitch	Turntable/U.S.A.
<i>Guiro/Cuba</i>	scraping sound and technique	Turntable/U.S.A.
<i>Snare drum/Switzerland</i>	sound modifier	Turntable/U.S.A.
<i>Djembé/Guinea</i>	application in dance	Turntable/U.S.A.
<i>Steel drum/Trinidad</i>	application in popular music	Turntable/U.S.A.

The Turntable can be considered an extension of many traditional instruments as well as a number of electronic instruments that have become increasingly prominent in today's music. These extensions stem from both the Turntable's classification as a friction instrument and its electronic capabilities.

• Design/Construction Materials and Methods

Horsehair, which is used to produce the friction and sound of the *buhai*, is an ancient material that has been used for many musical instruments including the bows of stringed instruments. The Turntable, on the other hand, is designed to produce its friction sound by rubbing a needle against the grooves in a vinyl record. This manual method of sound creation makes it both similar to and different from not only the *buhai* from Romania, but also to other friction instruments such as the *cuica* from Brazil. However, the Turntable significantly extends these conventional drumhead and drumshell technologies by controlling the sound with a mixer and amplifying the sound using electronic circuits and loudspeakers.



The development of the Turntable in the United States during the last half of the 20th century was the result of influences and changes in music and musical instruments throughout the world.

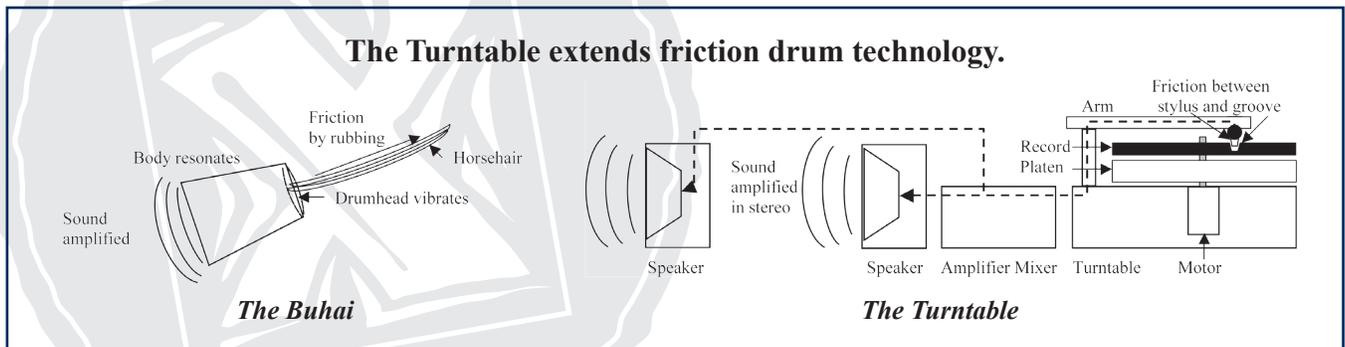
The Turntable



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• Playing Techniques

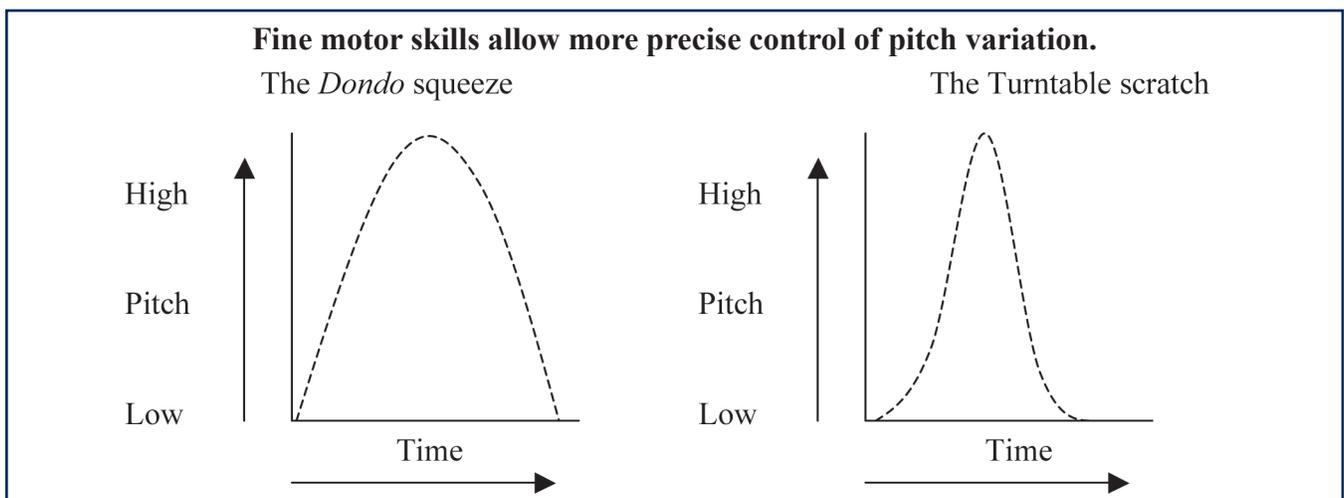
The Turntable extends the technique of playing friction drums in several ways. On the *buhai* friction occurs when the thumb and forefingers first pinch and then pull down a bundle of horsehair, away from the drumhead. This, as well as the squeezing techniques used on the African *dondo*, are considered large or “gross” motor skills. Creating friction on the Turntable involves a fine motor skill when subtle motions controlling direction, speed and pressure produce a variety of friction sounds as the needle rubs against the grooves of a vinyl record. Another important extension takes place when the Turntable performer creates friction by moving in two directions (forward and backward) instead of just one direction as on the *buhai*; similar to the back and forth rubbing motion used on the *cuica*.



• Quality or Type of Sound

Modifying the basic sound of an instrument is a common practice among the percussion family, for example, the snares of a snare drum or the beads in an *adufe*. The Turntable’s sound can be modified both manually by the performer and electronically by electronic controls including volume and tone as well as through other effects like reverb and echo. With sampling and electronic editing, the final sound can be noticeably changed from the record’s original sound.

The Turntable can also be considered an extension of the *dondo*. While both instruments can vary the pitch of the instrument, the *dondo* has a slower increase in pitch and takes slightly longer to return to the lower pitch. The Turntable scratch, on the other hand, is faster on the rise in pitch and returns more quickly to the original pitch. The following diagram shows the glissandos or sliding effects of pitches on the two instruments plotted in time.



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The Turntable DJ more often uses friction in the grooves to make various non-pitched scratching sounds rather than pitched melodic sounds. This is similar to the type of sound created by rubbing a stick against the grooves of a Cuban *guiro*.

While traditional friction instruments and the Turntable are capable of creating many pitches, the Turntable extends these capabilities to produce a wider variety of sounds through the combination of physical control, electronic effects and the selection of the type of sounds contained on the record, itself. Furthermore, one vinyl record can have hundreds of grooves to choose from for the friction effect.

• Musical Style or Application

The Turntable is a musical invention by today's urban youth intended specifically for music created and performed in the hip-hop culture. It incorporates many cultural influences and technological advances, yet it used to express individual styles and techniques. In this way, the Turntable represents important connections to a variety of past and present African, European and American cultures.



Extensions