

= Musical instrument =

A musical instrument is an instrument created or adapted to make musical sounds . In principle , any object that produces sound can be a musical instrument ? it is through purpose that the object becomes a musical instrument . The history of musical instruments dates to the beginnings of human culture . Early musical instruments may have been used for ritual , such as a trumpet to signal success on the hunt , or a drum in a religious ceremony . Cultures eventually developed composition and performance of melodies for entertainment . Musical instruments evolved in step with changing applications .

The date and origin of the first device considered a musical instrument is disputed . The oldest object that some scholars refer to as a musical instrument , a simple flute , dates back as far as 67 000 years . Some consensus dates early flutes to about 37 000 years ago . However , most historians believe that determining a specific time of musical instrument invention is impossible due to the subjectivity of the definition and the relative instability of materials used to make them . Many early musical instruments were made from animal skins , bone , wood , and other non-durable materials .

Musical instruments developed independently in many populated regions of the world . However , contact among civilizations caused rapid spread and adaptation of most instruments in places far from their origin . By the Middle Ages , instruments from Mesopotamia were in maritime Southeast Asia , and Europeans played instruments from North Africa . Development in the Americas occurred at a slower pace , but cultures of North , Central , and South America shared musical instruments . By 1400 , musical instrument development slowed in many areas and was dominated by the Occident .

Musical instrument classification is a discipline in its own right , and many systems of classification have been used over the years . Instruments can be classified by their effective range , their material composition , their size , etc . However , the most common academic method , Hornbostel-Sachs , uses the means by which they produce sound . The academic study of musical instruments is called organology .

= Definition and basic operation =

A musical instrument makes sounds . Once humans moved from making sounds with their bodies ? for example , by clapping ? to using objects to create music from sounds , musical instruments were born . Primitive instruments were probably designed to emulate natural sounds , and their purpose was ritual rather than entertainment . The concept of melody and the artistic pursuit of musical composition were unknown to early players of musical instruments . A player sounding a flute to signal the start of a hunt does so without thought of the modern notion of " making music " .

Musical instruments are constructed in a broad array of styles and shapes , using many different materials . Early musical instruments were made from " found objects " such as shells and plant parts . As instruments evolved , so did the selection and quality of materials . Virtually every material in nature has been used by at least one culture to make musical instruments . One plays a musical instrument by interacting with it in some way ? for example , by plucking the strings on a string instrument .

= Archaeology =

Researchers have discovered archaeological evidence of musical instruments in many parts of the world . Some finds are 67 000 years old , however their status as musical instruments is often in dispute . Consensus solidifies about artifacts dated back to around 37 000 years old and later . Only artifacts made from durable materials or using durable methods tend to survive . As such , the specimens found cannot be irrefutably placed as the earliest musical instruments .

In July 1995 , Slovenian archaeologist Ivan Turk discovered a bone carving in the northwest region of Slovenia . The carving , named the Divje Babe Flute , features four holes that Canadian

musicologist Bob Fink determined could have been used to play four notes of a diatonic scale . Researchers estimate the flute 's age at between 43 @,@ 400 and 67 @,@ 000 years , making it the oldest known musical instrument and the only musical instrument associated with the Neanderthal culture . However , some archaeologists and ethnomusicologists dispute the flute 's status as a musical instrument . German archaeologists have found mammoth bone and swan bone flutes dating back to 30 @,@ 000 to 37 @,@ 000 years old in the Swabian Alps . The flutes were made in the Upper Paleolithic age , and are more commonly accepted as being the oldest known musical instruments .

Archaeological evidence of musical instruments was discovered in excavations at the Royal Cemetery in the Sumerian city of Ur . These instruments , one of the first ensembles of instruments yet discovered , include nine lyres (the Lyres of Ur) , two harps , a silver double flute , sistrum and cymbals . A set of reed @-@ sounded silver pipes discovered in Ur was the likely predecessor of modern bagpipes . The cylindrical pipes feature three side @-@ holes that allowed players to produce whole tone scales . These excavations , carried out by Leonard Woolley in the 1920s , uncovered non @-@ degradable fragments of instruments and the voids left by the degraded segments that , together , have been used to reconstruct them . The graves these instruments were buried in have been carbon dated to between 2600 and 2500 BC , providing evidence that these instruments were used in Sumeria by this time .

Archaeologists in the Jiahu site of central Henan province of China have found flutes made of bones that date back 7 @,@ 000 to 9 @,@ 000 years , representing some of the " earliest complete , playable , tightly @-@ dated , multinode musical instruments " ever found .

= = History = =

Scholars agree that there are no completely reliable methods of determining the exact chronology of musical instruments across cultures . Comparing and organizing instruments based on their complexity is misleading , since advancements in musical instruments have sometimes reduced complexity . For example , construction of early slit drums involved felling and hollowing out large trees ; later slit drums were made by opening bamboo stalks , a much simpler task .

German musicologist Curt Sachs , one of the most prominent musicologists and musical ethnologists in modern times , argues that it is misleading to arrange the development of musical instruments by workmanship , since cultures advance at different rates and have access to different raw materials . He maintains , for example , that contemporary anthropologists comparing musical instruments from two cultures that existed at the same time but differed in organization , culture , and handicraft cannot determine which instruments are more " primitive " . Ordering instruments by geography is also not totally reliable , as it cannot always be determined when and how cultures contacted one another and shared knowledge .

Sachs proposed that a geographical chronology until approximately 1400 is preferable , however , due to its limited subjectivity . Beyond 1400 , one can follow the overall development of musical instruments by time period .

The science of marking the order of musical instrument development relies on archaeological artifacts , artistic depictions , and literary references . Since data in one research path can be inconclusive , all three paths provide a better historical picture .

= = = Primitive and prehistoric = = =

Until the 19th century AD , European @-@ written music histories began with mythological accounts of how musical instruments were invented . Such accounts included Jubal , descendant of Cain and " father of all such as handle the harp and the organ " , Pan , inventor of the pan pipes , and Mercury , who is said to have made a dried tortoise shell into the first lyre . Modern histories have replaced such mythology with anthropological speculation , occasionally informed by archeological evidence . Scholars agree that there was no definitive " invention " of the musical instrument since the definition of the term " musical instrument " is completely subjective to both the

scholar and the would @-@ be inventor . For example , a Homo habilis slapping his body could be the makings of a musical instrument regardless of the being 's intent .

Among the first devices external to the human body that are considered instruments are rattles , stampers , and various drums . These earliest instruments evolved due to the human motor impulse to add sound to emotional movements such as dancing . Eventually , some cultures assigned ritual functions to their musical instruments , using them for hunting and various ceremonies . Those cultures developed more complex percussion instruments and other instruments such as ribbon reeds , flutes , and trumpets . Some of these labels carry far different connotations from those used in modern day ; early flutes and trumpets are so @-@ labeled for their basic operation and function rather than any resemblance to modern instruments . Among early cultures for whom drums developed ritual , even sacred importance are the Chukchi people of the Russian Far East , the indigenous people of Melanesia , and many cultures of Africa . In fact , drums were pervasive throughout every African culture . One East African tribe , the Wahinda , believed it was so holy that seeing a drum would be fatal to any person other than the sultan .

Humans eventually developed the concept of using musical instruments for producing a melody . Until this time in the evolutions of musical instruments , melody was common only in singing . Similar to the process of reduplication in language , instrument players first developed repetition and then arrangement . An early form of melody was produced by pounding two stamping tubes of slightly different sizes ? one tube would produce a " clear " sound and the other would answer with a " darker " sound . Such instrument pairs also included bullroarers , slit drums , shell trumpets , and skin drums . Cultures who used these instrument pairs associated genders with them ; the " father " was the bigger or more energetic instrument , while the " mother " was the smaller or duller instrument . Musical instruments existed in this form for thousands of years before patterns of three or more tones would evolve in the form of the earliest xylophone . Xylophones originated in the mainland and archipelago of Southeast Asia , eventually spreading to Africa , the Americas , and Europe . Along with xylophones , which ranged from simple sets of three " leg bars " to carefully tuned sets of parallel bars , various cultures developed instruments such as the ground harp , ground zither , musical bow , and jaw harp .

= = = Antiquity = = =

Images of musical instruments begin to appear in Mesopotamian artifacts in 2800 BC or earlier . Beginning around 2000 BC , Sumerian and Babylonian cultures began delineating two distinct classes of musical instruments due to division of labor and the evolving class system . Popular instruments , simple and playable by anyone , evolved differently from professional instruments whose development focused on effectiveness and skill . Despite this development , very few musical instruments have been recovered in Mesopotamia . Scholars must rely on artifacts and cuneiform texts written in Sumerian or Akkadian to reconstruct the early history of musical instruments in Mesopotamia . Even the process of assigning names to these instruments is challenging since there is no clear distinction among various instruments and the words used to describe them .

Although Sumerian and Babylonian artists mainly depicted ceremonial instruments , historians have been able to distinguish six idiophones used in early Mesopotamia : concussion clubs , clappers , sistra , bells , cymbals , and rattles . Sistra are depicted prominently in a great relief of Amenhotep III , and are of particular interest because similar designs have been found in far @-@ reaching places such as Tbilisi , Georgia and among the Native American Yaqui tribe . The people of Mesopotamia preferred stringed instruments to any other , as evidenced by their proliferation in Mesopotamian figurines , plaques , and seals . Innumerable varieties of harps are depicted , as well as lyres and lutes , the forerunner of modern stringed instruments such as the violin .

Musical instruments used by the Egyptian culture before 2700 BC bore striking similarity to those of Mesopotamia , leading historians to conclude that the civilizations must have been in contact with one another . Sachs notes that Egypt did not possess any instruments that the Sumerian culture did not also possess . However , by 2700 BC the cultural contacts seem to have dissipated ; the lyre , a prominent ceremonial instrument in Sumer , did not appear in Egypt for another 800 years .

Clappers and concussion sticks appear on Egyptian vases as early as 3000 BC . The civilization also made use of sistra , vertical flutes , double clarinets , arched and angular harps , and various drums .

Little history is available in the period between 2700 BC and 1500 BC , as Egypt (and indeed , Babylon) entered a long violent period of war and destruction . This period saw the Kassites destroy the Babylonian empire in Mesopotamia and the Hyksos destroy the Middle Kingdom of Egypt . When the Pharaohs of Egypt conquered Southwest Asia in around 1500 BC , the cultural ties to Mesopotamia were renewed and Egypt 's musical instruments also reflected heavy influence from Asiatic cultures . Under their new cultural influences , the people of the New Kingdom began using oboes , trumpets , lyres , lutes , castanets , and cymbals .

In contrast with Mesopotamia and Egypt , professional musicians did not exist in Israel between 2000 and 1000 BC . While the history of musical instruments in Mesopotamia and Egypt relies on artistic representations , the culture in Israel produced few such representations . Scholars must therefore rely on information gleaned from the Bible and the Talmud . The Hebrew texts mention two prominent instruments associated with Jubal : the ugar (pipes) and kinnor (lyre) . Other instruments of the period included the tof (frame drum) , pa 'amon (small bells or jingles) , shofar , and the trumpet @-@ like hasosra .

The introduction of a monarchy in Israel during the 11th century BC produced the first professional musicians and with them a drastic increase in the number and variety of musical instruments . However , identifying and classifying the instruments remains a challenge due to the lack of artistic interpretations . For example , stringed instruments of uncertain design called nevals and asors existed , but neither archaeology nor etymology can clearly define them . In her book A Survey of Musical Instruments , American musicologist Sibyl Marcuse proposes that the nevel must be similar to vertical harp due to its relation to nabla , the Phoenician term for " harp " .

In Greece , Rome , and Etruria , the use and development of musical instruments stood in stark contrast to those cultures ' achievements in architecture and sculpture . The instruments of the time were simple and virtually all of them were imported from other cultures . Lyres were the principal instrument , as musicians used them to honor the gods . Greeks played a variety of wind instruments they classified as aulos (reeds) or syrinx (flutes) ; Greek writing from that time reflects a serious study of reed production and playing technique . Romans played reed instruments named tibia , featuring side @-@ holes that could be opened or closed , allowing for greater flexibility in playing modes . Other instruments in common use in the region included vertical harps derived from those of the Orient , lutes of Egyptian design , various pipes and organs , and clappers , which were played primarily by women .

Evidence of musical instruments in use by early civilizations of India is almost completely lacking , making it impossible to reliably attribute instruments to the Munda and Dravidian language @-@ speaking cultures that first settled the area . Rather , the history of musical instruments in the area begins with the Indus Valley Civilization that emerged around 3000 BC . Various rattles and whistles found among excavated artifacts are the only physical evidence of musical instruments . A clay statuette indicates the use of drums , and examination of the Indus script has also revealed representations of vertical arched harps identical in design to those depicted in Sumerian artifacts . This discovery is among many indications that the Indus Valley and Sumerian cultures maintained cultural contact . Subsequent developments in musical instruments in India occurred with the Rigveda , or hymns . These songs used various drums , shell trumpets , harps , and flutes . Other prominent instruments in use during the early centuries AD were the snake charmer 's double clarinet , bagpipes , barrel drums , cross flutes , and short lutes . In all , India had no unique musical instruments until the Middle Ages .

Musical instruments such as zithers appeared in Chinese writings around 12th century BC and earlier . Early Chinese philosophers such as Confucius (551 ? 479 BC) , Mencius (372 ? 289 BC) , and Laozi shaped the development of musical instruments in China , adopting an attitude toward music similar to that of the Greeks . The Chinese believed that music was an essential part of character and community , and developed a unique system of classifying their musical instruments according to their material makeup .

Idiophones were extremely important in Chinese music , hence the majority of early instruments were idiophones . Poetry of the Shang dynasty mentions bells , chimes , drums , and globular flutes carved from bone , the latter of which has been excavated and preserved by archaeologists . The Zhou dynasty saw percussion instruments such as clappers , troughs , wooden fish , and y? (wooden tiger) . Wind instruments such as flute , pan @-@ pipes , pitch @-@ pipes , and mouth organs also appeared in this time period . The xiao (an end @-@ blown flute) and various other instruments that spread through many cultures , came into use in China during and after the Han dynasty .

Although civilizations in Central America attained a relatively high level of sophistication by the eleventh century AD , they lagged behind other civilizations in the development of musical instruments . For example , they had no stringed instruments ; all of their instruments were idiophones , drums , and wind instruments such as flutes and trumpets . Of these , only the flute was capable of producing a melody . In contrast , pre @-@ Columbian South American civilizations in areas such as modern @-@ day Peru , Colombia , Ecuador , Bolivia , and Chile were less advanced culturally but more advanced musically . South American cultures of the time used pan @-@ pipes as well as varieties of flutes , idiophones , drums , and shell or wood trumpets .

= = = Middle Ages = = =

During the period of time loosely referred to as the Middle Ages , China developed a tradition of integrating musical influence from other regions . The first record of this type of influence is in 384 AD , when China established an orchestra in its imperial court after a conquest in Turkestan . Influences from Middle East , Persia , India , Mongolia , and other countries followed . In fact , Chinese tradition attributes many musical instruments from this period to those regions and countries . Cymbals gained popularity , along with more advanced trumpets , clarinets , oboes , flutes , drums , and lutes . Some of the first bowed zithers appeared in China in the 9th or 10th century , influenced by Mongolian culture .

India experienced similar development to China in the Middle Ages ; however , stringed instruments developed differently as they accommodated different styles of music . While stringed instruments of China were designed to produce precise tones capable of matching the tones of chimes , stringed instruments of India were considerably more flexible . This flexibility suited the slides and tremolos of Hindu music . Rhythm was of paramount importance in Indian music of the time , as evidenced by the frequent depiction of drums in reliefs dating to the Middle Ages . The emphasis on rhythm is an aspect native to Indian music . Historians divide the development of musical instruments in medieval India between pre @-@ Islamic and Islamic periods due to the different influence each period provided .

In pre @-@ Islamic times , idiophones such hand bells , cymbals , and peculiar instruments resembling gongs came into wide use in Hindu music . The gong @-@ like instrument was a bronze disk that was struck with a hammer instead of a mallet . Tubular drums , stick zithers (veena) , short fiddles , double and triple flutes , coiled trumpets , and curved India horns emerged in this time period . Islamic influences brought new types of drums , perfectly circular or octagonal as opposed to the irregular pre @-@ Islamic drums . Persian influence brought oboes and sitars , although Persian sitars had three strings and Indian version had from four to seven .

Southeast Asian musical innovations include those during a period of Indian influence that ended around 920 AD . Balinese and Javanese music made use of xylophones and metallophones , bronze versions of the former . The most prominent and important musical instrument of Southeast Asia was the gong . While the gong likely originated in the geographical area between Tibet and Burma , it was part of every category of human activity in maritime Southeast Asia including Java .

The areas of Mesopotamia and the Arabian Peninsula experiences rapid growth and sharing of musical instruments once they were united by Islamic culture in the seventh century . Frame drums and cylindrical drums of various depths were immensely important in all genres of music . Conical oboes were involved in the music that accompanied wedding and circumcision ceremonies . Persian miniatures provide information on the development of kettle drums in Mesopotamia that spread as

far as Java . Various lutes , zithers , dulcimers , and harps spread as far as Madagascar to the south and modern @-@ day Sulawesi to the east .

Despite the influences of Greece and Rome , most musical instruments in Europe during the Middle Ages came from Asia . The lyre is the only musical instrument that may have been invented in Europe until this period . Stringed instruments were prominent in Middle Age Europe . The central and northern regions used mainly lutes , stringed instruments with necks , while the southern region used lyres , which featured a two @-@ armed body and a crossbar . Various harps served Central and Northern Europe as far north as Ireland , where the harp eventually became a national symbol . Lyres propagated through the same areas , as far east as Estonia .

European music between 800 and 1100 became more sophisticated , more frequently requiring instruments capable of polyphony . The 9th @-@ century Persian geographer Ibn Khordadbeh mentioned in his lexicographical discussion of music instruments that , in the Byzantine Empire , typical instruments included the *urghun* (organ) , *shilyani* (probably a type of harp or lyre) , *salandj* (probably a bagpipe) and the *lyra* . The Byzantine *lyra* , a bowed string instrument , is an ancestor of most European bowed instruments , including the violin .

The monochord served as a precise measure of the notes of a musical scale , allowing more accurate musical arrangements . Mechanical hurdy @-@ gurdies allowed single musicians to play more complicated arrangements than a fiddle would ; both were prominent folk instruments in the Middle Ages . Southern Europeans played short and long lutes whose pegs extended to the sides , unlike the rear @-@ facing pegs of Central and Northern European instruments . Idiophones such as bells and clappers served various practical purposes , such as warning of the approach of a leper .

The ninth century revealed the first bagpipes , which spread throughout Europe and had many uses from folk instruments to military instruments . The construction of pneumatic organs evolved in Europe starting in fifth @-@ century Spain , spreading to England in about 700 . The resulting instruments varied in size and use from portable organs worn around the neck to large pipe organs . Literary accounts of organs being played in English Benedictine abbeys toward the end of the tenth century are the first references to organs being connected to churches . Reed players of the Middle Ages were limited to oboes ; no evidence of clarinets exists during this period .

= = = Modern = = =

= = = = Renaissance = = = =

Musical instrument development was dominated by the Occident from 1400 on , indeed , the most profound changes occurred during the Renaissance period . Instruments took on other purposes than accompanying singing or dance , and performers used them as solo instruments . Keyboards and lutes developed as polyphonic instruments , and composers arranged increasingly complex pieces using more advanced tablature . Composers also began designing pieces of music for specific instruments . In the latter half of the sixteenth century , orchestration came into common practice as a method of writing music for a variety of instruments . Composers now specified orchestration where individual performers once applied their own discretion . The polyphonic style dominated popular music , and the instrument makers responded accordingly .

Beginning in about 1400 , the rate of development of musical instruments increased in earnest as compositions demanded more dynamic sounds . People also began writing books about creating , playing , and cataloging musical instruments ; the first such book was Sebastian Virdung 's 1511 treatise *Musica getuscht und ausgezogen* (' Music Germanized and Abstracted ') . Virdung 's work is noted as being particularly thorough for including descriptions of " irregular " instruments such as hunters ' horns and cow bells , though Virdung is critical of the same . Other books followed , including Arnolt Schlick 's *Spiegel der Orgelmacher und Organisten* (' Mirror of Organ Makers and Organ Players ') the following year , a treatise on organ building and organ playing . Of the instructional books and references published in the Renaissance era , one is noted for its detailed

description and depiction of all wind and stringed instruments , including their relative sizes . This book , the Syntagma musicum by Michael Praetorius , is now considered an authoritative reference of sixteenth @-@ century musical instruments .

In the sixteenth century , musical instrument builders gave most instruments ? such as the violin ? the " classical shapes " they retain today . An emphasis on aesthetic beauty also developed ; listeners were as pleased with the physical appearance of an instrument as they were with its sound . Therefore , builders paid special attention to materials and workmanship , and instruments became collectibles in homes and museums . It was during this period that makers began constructing instruments of the same type in various sizes to meet the demand of consorts , or ensembles playing works written for these groups of instruments .

Instrument builders developed other features that endure today . For example , while organs with multiple keyboards and pedals already existed , the first organs with solo stops emerged in the early fifteenth century . These stops were meant to produce a mixture of timbres , a development needed for the complexity of music of the time . Trumpets evolved into their modern form to improve portability , and players used mutes to properly blend into chamber music .

= = = = Baroque = = = =

Beginning in the seventeenth century , composers began creating works of a more emotional style . They felt that a monophonic style better suited the emotional music and wrote musical parts for instruments that would complement the singing human voice . As a result , many instruments that were incapable of larger ranges and dynamics , and therefore were seen as unemotional , fell out of favor . One such instrument was the shawm . Bowed instruments such as the violin , viola , baryton , and various lutes dominated popular music . Beginning in around 1750 , however , the lute disappeared from musical compositions in favor of the rising popularity of the guitar . As the prevalence of string orchestras rose , wind instruments such as the flute , oboe , and bassoon were readmitted to counteract the monotony of hearing only strings .

In the mid @-@ seventeenth century , what was known as a hunter 's horn underwent transformation into an " art instrument " consisting of a lengthened tube , a narrower bore , a wider bell , and much wider range . The details of this transformation are unclear , but the modern horn or , more colloquially , French horn , had emerged by 1725 . The slide trumpet appeared , a variation that includes a long @-@ throated mouthpiece that slid in and out , allowing the player infinite adjustments in pitch . This variation on the trumpet was unpopular due to the difficulty involved in playing it . Organs underwent tonal changes in the Baroque period , as manufacturers such as Abraham Jordan of London made the stops more expressive and added devices such as expressive pedals . Sachs viewed this trend as a " degeneration " of the general organ sound .

= = = = Classical and Romantic = = = =

During the Classical and Romantic periods of music , lasting from roughly 1750 to 1900 , a great deal of musical instruments capable of producing new timbres and higher volume were developed and introduced into popular music . The design changes that broadened the quality of timbres allowed instruments to produce a wider variety of expression . Large orchestras rose in popularity and , in parallel , the composers determined to produce entire orchestral scores that made use of the expressive abilities of modern instruments . Since instruments were involved in collaborations of a much larger scale , their designs had to evolve to accommodate the demands of the orchestra .

Some instruments also had to become louder to fill larger halls and be heard over sizable orchestras . Flutes and bowed instruments underwent many modifications and design changes ? most of them unsuccessful ? in efforts to increase volume . Other instruments were changed just so they could play their parts in the scores . Trumpets traditionally had a " defective " range ? they were incapable of producing certain notes with precision . New instruments such as the clarinet , saxophone , and tuba became fixtures in orchestras . Instruments such as the clarinet also grew into entire " families " of instruments capable of different ranges : small clarinets , normal clarinets , bass

clarinets , and so on .

Accompanying the changes to timbre and volume was a shift in the typical pitch used to tune instruments . Instruments meant to play together , as in an orchestra , must be tuned to the same standard lest they produce audibly different sounds while playing the same notes . Beginning in 1762 , the average concert pitch began rising from a low of 377 vibrations to a high of 457 in 1880 Vienna . Different regions , countries , and even instrument manufacturers preferred different standards , making orchestral collaboration a challenge . Despite even the efforts of two organized international summits attended by noted composers like Hector Berlioz , no standard could be agreed upon .

= = = Twentieth century to present = = =

The evolution of traditional musical instruments slowed beginning in the twentieth century . Instruments like the violin , flute , french horn , harp , and so on are largely the same as those manufactured throughout the eighteenth and nineteenth centuries . Gradual iterations do emerge ; for example , the " New Violin Family " began in 1964 to provide differently sized violins to expand the range of available sounds . The slowdown in development was practical response to the concurrent slowdown in orchestra and venue size . Despite this trend in traditional instruments , the development of new musical instruments exploded in the twentieth century . The sheer variety of instruments developed overshadows any prior period .

The proliferation of electricity in the twentieth century lead to the creation of an entirely new category of musical instruments : electronic instruments , or electrophones . The vast majority of electrophones produced in the first half of the twentieth century were what Sachs called " electromechanical instruments " . In other words , they have mechanical parts that produce sound vibrations , and those vibrations are picked up and amplified by electrical components . Examples of electromechanical instruments include Hammond organs and electric guitars . Sachs also defined a subcategory of " radioelectric instruments " such as the theremin , which produces music through the player 's hand movements around two antennas .

The latter half of the twentieth century saw the gradual evolution of synthesizers ? instruments that artificially produce sound using analog or digital circuits and microchips . In the late 1960s , Bob Moog and other inventors began an era of development of commercial synthesizers . One of the first of these instruments was the Moog synthesizer . The modern proliferation of computers and microchips has spawned an entire industry around electronic musical instruments .

= = Classification = =

There are many different methods of classifying musical instruments . Various methods examine aspects such as the physical properties of the instrument (material , color , shape , etc .) , the use for the instrument , the means by which music is produced with the instrument , the range of the instrument , and the instrument 's place in an orchestra or other ensemble . Most methods are specific to a geographic area or cultural group and were developed to serve the unique classification requirements of the group . The problem with these specialized classification schemes is that they tend to break down once they are applied outside of their original area . For example , a system based on instrument use would fail if a culture invented a new use for the same instrument . Scholars recognize Hornbostel @-@ Sachs as the only system that applies to any culture and , more important , provides only possible classification for each instrument . The most common types of instrument classifications are strings , brass , woodwind , and percussion .

= = = Ancient systems = = =

An ancient system named the Natya Shastra , written by the sage Bharata Muni and dating from between 200 BC and 200 AD , divides instruments into four main classification groups : instruments where the sound is produced by vibrating strings ; percussion instruments with skin heads ;

instruments where the sound is produced by vibrating columns of air ; and " solid " , or non @-@ skin , percussion instruments . This system was adapted to some degree in 12th @-@ century Europe by Johannes de Muris , who used the terms tensibilia (stringed instruments) , inflatibilia (wind instruments) , and percussibilia (all percussion instruments) . In 1880 , Victor @-@ Charles Mahillon adapted the Natya Shastra and assigned Greek labels to the four classifications : chordophones (stringed instruments) , membranophones (skin @-@ head percussion instruments) , aerophones (wind instruments) , and autophones (non @-@ skin percussion instruments) .

== = Hornbostel @-@ Sachs == =

Erich von Hornbostel and Curt Sachs adopted Mahillon 's scheme and published an extensive new scheme for classification in Zeitschrift für Ethnologie in 1914 . Hornbostel and Sachs used most of Mahillon 's system , but replaced the term autophone with idiophone .

The original Hornbostel @-@ Sachs system classified instruments into four main groups :

Idiophones , which produce sound by vibrating the primary body of the instrument itself ; they are sorted into concussion , percussion , shaken , scraped , split , and plucked idiophones , such as claves , xylophone , guiro , slit drum , mbira , and rattle .

Membranophones , which produce sound by vibrating a stretched membrane ; they may be drums (further sorted by the shape of the shell) , which are struck by hand , with a stick , or rubbed , but kazoos and other instruments that use a stretched membrane for the primary sound (not simply to modify sound produced in another way) are also considered membranophones .

Chordophones , which produce sound by vibrating one or more strings ; they are sorted into according to the relationship between the string (s) and the sounding board or chamber . For example , if the strings are laid out parallel to the sounding board and there is no neck , the instrument is a zither whether it is plucked like an autoharp or struck with hammers like a piano . If the instrument has strings parallel to the sounding board or chamber and the strings extend past the board with a neck , then the instrument is a lute , whether the sound chamber is constructed of wood like a guitar or uses a membrane like a banjo .

Aerophones , which produce a sound with a vibrating column of air ; they are sorted into free aerophones such as a bullroarer or whip , which move freely through the air ; flutes , which cause the air to pass over a sharp edge ; reed instruments , which use a vibrating reed ; and lip @-@ vibrated aerophones such as trumpets , for which the lips themselves function as vibrating reeds .

Sachs later added a fifth category , electrophones , such as theremins , which produce sound by electronic means . Within each category are many subgroups . The system has been criticised and revised over the years , but remains widely used by ethnomusicologists and organologists .

== = Schaeffner == =

Andre Schaeffner , a curator at the Musée de l 'Homme , disagreed with the Hornbostel @-@ Sachs system and developed his own system in 1932 . Schaeffner believed that the pure physics of a musical instrument , rather than its specific construction or playing method , should always determine its classification . (Hornbostel @-@ Sachs , for example , divide aerophones on the basis of sound production , but membranophones on the basis of the shape of the instrument) . His system divided instruments into two categories : instruments with solid , vibrating bodies and instruments containing vibrating air .

== = Range == =

Musical instruments are also often classified by their musical range in comparison with other instruments in the same family . This exercise is useful when placing instruments in context of an orchestra or other ensemble .

These terms are named after singing voice classifications :

Soprano instruments : flute , violin , soprano saxophone , trumpet , clarinet , oboe , piccolo

Alto instruments : alto saxophone , french horn , english horn , viola , alto horn

Tenor instruments : trombone , tenor saxophone , guitar , tenor drum

Baritone instruments : bassoon , baritone saxophone , bass clarinet , cello , baritone horn , euphonium

Bass instruments : double bass , bass guitar , bass saxophone , tuba , bass drum

Some instruments fall into more than one category : for example , the cello may be considered tenor , baritone or bass , depending on how its music fits into the ensemble , and the trombone may be alto , tenor , baritone , or bass and the French horn , bass , baritone , tenor , or alto , depending on the range it is played in . Many instruments have their range as part of their name : soprano saxophone , tenor saxophone , baritone horn , alto flute , bass guitar , etc . Additional adjectives describe instruments above the soprano range or below the bass , for example : sopranino saxophone , contrabass clarinet . When used in the name of an instrument , these terms are relative , describing the instrument 's range in comparison to other instruments of its family and not in comparison to the human voice range or instruments of other families . For example , a bass flute 's range is from C3 to F ? 6 , while a bass clarinet plays about one octave lower .

= = Construction = =

The materials used in making musical instruments vary greatly by culture and application . Many of the materials have special significance owing to their source or rarity . Some cultures worked substances from the human body into their instruments . In ancient Mexico , for example , the material drums were made from might contain actual human body parts obtained from sacrificial offerings . In New Guinea , drum makers would mix human blood into the adhesive used to attach the membrane . Mulberry trees are held in high regard in China owing to their mythological significance ? instrument makers would hence use them to make zithers . The Yakuts believe that making drums from trees struck by lightning gives them a special connection to nature .

Musical instrument construction is a specialized trade that requires years of training , practice , and sometimes an apprenticeship . Most makers of musical instruments specialize in one genre of instruments ; for example , a luthier makes only stringed instruments . Some make only one type of instrument such as a piano . Whatever the instrument constructed , the instrument maker must consider materials , construction technique , and decoration , creating a balanced instrument that is both functional and aesthetically pleasing . Some builders are focused on a more artistic approach and develop experimental musical instruments , often meant for individual playing styles developed by the builder himself .

= = User interfaces = =

Regardless of how the sound in an instrument is produced , many musical instruments have a keyboard as the user @-@ interface . Keyboard instruments are any instruments that are played with a musical keyboard . Every key generates one or more sounds ; most keyboard instruments have extra means (pedals for a piano , stops and a pedal keyboard for an organ) to manipulate these sounds . They may produce sound by wind being fanned (organ) or pumped (accordion) , vibrating strings either hammered (piano) or plucked (harpsichord) , by electronic means (synthesizer) , or in some other way . Sometimes , instruments that do not usually have a keyboard , such as the glockenspiel , are fitted with one . Though they have no moving parts and are struck by mallets held in the player 's hands , they have the same physical arrangement of keys and produce soundwaves in a similar manner .