



(Image courtesy the Famous Maroon Band (Mississippi State University, my alma mater) Facebook page)

Categorizing Musical Instruments

Introduction: So...what *is* a “musical instrument” exactly?

Musical instruments cover a pantheon of objects and definitions. As many know, a wooden spoon applied with the proper amount of force to the bottom of an overturned pot produces a quite distinct and far-carrying percussive sound. Is that combination of wooden spoon and twenty-quart stock pot considered a musical instrument?

The typical definition, provided by the online version of the Oxford English Dictionary, of a musical instrument is “an object or device for producing musical sounds.” By this definition, the pot-and-spoon combination would be considered a musical instrument. This is problematic for this particular assignment. Under the above definition not only can a pot banged on with a spoon be considered an instruments, but one’s voice could be considered a musical instrument as the larynx is an “object” that produces a musical (or not musical, dependent on the individual) sound when air is forced through it.

For the purposes of this project, a musical instrument is a physically tangible external object that is manually manipulated to produce a musical sound. A musical instrument

has heft and a corporeal form, be it the tiniest of tin whistles or the largest of pipe organs, the most complex of MIDI arrays or the simplest of triangles, and needs to have some form of interaction to produce the aforementioned musical sound. Historical, tribal, and archaic instruments are included in this schema, as they are still utilized and need to be properly categorized.

History of Musical Instrument Classification: The *bā yīn* System and its Counterparts Globally

Humans have been creating music using objects for thousands of years. Nearly as long as we have enjoyed music, we have sought to categorize the objects we use to create said music into distinct classifications. In Margaret J. Kartomi's 1990 book *On Concepts and Classifications of Musical Instruments*, considered to be the preeminent work on the categorization and classification of musical instruments, she identified one of the earliest methods of classification as traced back to the Chinese Sān Huáng Wǔ Dì period (三皇五帝, or "Three Sovereigns and Five Emperors", pre-夏/Xia Dynasty), around 2300 BCE. Sources of sound, or 音 (*yīn*, or "sound"), were categorized by the materials by which they were made rather than the sound they made (Kartomi, 1990, p. 37). This system evolved into the 八音 (*bā yīn*¹, or "eight sounds") system established around the reign of Emperor Shun which ran during the late third millennium BCE. Under the *bā yīn* system, musical instruments were categorized according to the material used to make them and the nature of the sound. Sounds were rooted in the *qì* (氣/气, or the spirit/energy of an object)², and they were omens and manifestations of the harmony or lack thereof in life and nature itself. Under the this system, instruments fell under one of the following eight headers:

¹ Kartomi identified this system as the "*pa yin*" system on page 37. I believe this is a Wade-Giles phonetic spelling of the character 八. I will be using Tonyong Pinyin phonetic spellings of names and phrases, as this is the more modern of the two systems.

² 氣 is the traditional character; 气 is the simplified modern character of the same term.

- 金 (*jīn*): gold, used for instruments made of a metallic substance
- 石 (*shí*): rock, used for instruments made from stone
- 土 (*tǔ*): earth, used for instruments made of clay
- 革 (*gé*): leather, used for instruments made of animal hide/leather
- 絲/丝 (*sī*): silk, used for instruments made of silk³
- 木 (*mù*): wood, used for instruments made of wood that was not bamboo
- 匏 (*páo*): gourd, used for instruments made of gourds or similar plants
- 竹 (*zhú*): bamboo, used for instruments made of bamboo. (Kartomi, 1990, p. 38-9)

The aforementioned system and its analogues, as Kartomi referenced multiple systems that share the same schematic as the *bā yīn* system and expanded upon it, was used with great regularity until the Ming Dynasty (明), circa 1368-1644 (Kartomi, 1990, p. 38-42). Zhu Zaiyu (朱載堉), an aristocratic historian often referred to as a prince, wrote multiple treatises on musicology and the arts in general. He took work first presented by Mǎ Duānlín (马端临) pertaining to the fact that not all instruments easily fell into the *bā yīn* schematic and developed a new classification system based on how the instrument was powered rather than exclusively classifying it by the material from which it was constructed (Kartomi, 1990, p. 44-6).

The Chinese were not the only early culture that sought to categorize and organize their musical instruments. Cultures around the world have utilized different classification methods for their musical instruments. Kartomi allotted a chapter each to the systems used by Indian/Srilankian, Tibetan, Javanese, ancient Greek, and Arabian cultures before the eighteenth century rapid ascent towards modernity. Each of these cultures, like the Chinese, came to rely heavily on the nature of the sound that the object made rather than the physical characteristics of the instruments themselves.

Commonly, these systems came to identify the instruments by three generalized categories; stringed, wind, or percussive instruments. This general categorization

³ 絲 is the traditional character; 丝 is the simplified modern character of the same term.

method has its roots in the Hellenistic period of ancient Greece, identified by Kartomi as taken straight from the 150th Psalm (Kartomi, 1990, p. 136). These three categories still persist to the current era as general classification terms for musical instruments.

Modern Musical Instrument Classifications: The Basics and the Hornbostel-Sachs System

Think back to your elementary school music classes; what did you learn about musical instruments? More often than not, we were taught that musical instruments fall into one of three major headings of either winds, strings, or percussion. These categories, much like the historical methods of classification, are dependent on the way that the instruments produced sound. As you get more in depth to the study of music, you discovered that these three classifications only scratch the surface of the type of instruments out there. Some instruments do not easily fit into these general headings, such as a piano or an accordion. Occasionally, keyboarded instruments are afforded their own category of classification.

Instruments are also commonly identified by their timbre, or the pitch range that they produce. Akin to the manner in which voices are classified, instruments can be identified as either soprano, alto, tenor, baritone, or bass. This proves to be problematic as well; instruments can fluctuate between different voices, given the notes played. There is no strict definition to the range of a soprano versus the range of an alto instrument.

After searching through music theory textbooks, reading through works on ethnomusicology and organology, and asking professionals in music education, I reached the conclusion that the most widely accepted method of classification is the Hornbostel-Sachs taxonomy system. Developed by Erich Moritz von Hornbostel and Curt Sachs in 1914 and translated into English in 1961, the system is based on prior work by Victor-Charles Mahillon, the curator of musical instruments at Brussels Conservatory. In Mahillon's system, circa 1890, he adapted centuries-old organizational

systems into a scheme where instruments fell into four broad categories according to the nature of the sound-producing material:

- a column of air
- strings
- percussive skins
- percussive bodies (Baines & Wachsmann, 1961, p. 4-6)

The issue inherent with Mahillon's system was that he strictly looked at instruments used in European classical music, not at any from other cultures or other styles of music. (Baines & Wachsmann, 1961, p. 6) Hornbostel and Sachs later expanded Mahillon's system to make it possible to classify any instrument from any culture. Their system identified instruments based on their method of vibration as it relates to sound transmission, much like Mahillon's, but clarified the definitions to better include non-Western instrumentation. At first, instruments fell into one of four top-level categories:

- *idiophones*, which are instruments which produce sound by vibrating themselves;
- *membranophones*, which are instruments which produce sound by a vibrating membrane;
- *chordophones*, which are instruments which produce sound by vibrating strings;
- and *aerophones*, which are instruments which produce sound by vibrating columns of air (Baines & Wachsmann, 1961, p. 3-11).

During the mid-twentieth century a fifth top-level category entitled *electrophones*, or instruments which produce sound electronically, was added to compensate for the rising usage of electronically-based instruments such as the theremin and moog.

Each of the five top-level categories had a series of sub-categories beneath them. For example, a piccolo (421.121.12) falls under the top-level category of an aerophone (4).

From there, it follows the following progression (MIMO, 2011, p.16-17):

- 4- Aerophone (sound is produced by a vibrating column of air)
 - 42- Wind instrument, proper (the vibrating column of air is contained within the instrument)
 - 421- Edge instruments/flutes (the air is directed against an edge to excite a column of air in a tube or a body of air in a cavity)
 - 421.1- Flutes without duct (the instrumentalist creates the ribbon-shaped stream of air with his/her lips)
 - 421.12- Side-blown flutes (the instrumentalist blows against a sharp rim on the side of the instrument)
 - 421.121- (Single) side-blown flutes
 - 421.121.1- Open side-blown flutes
 - 421.121.12- With fingerholes

Erich Moritz von Hornbostel and Curt Sachs, as translated by Anthony Baines and Klaus P. Wachsmann, referenced the Dewey Decimal System in their development the system. They stated that "the application of our findings in describing and cataloging is substantially facilitated by the use of the Dewey numerical system," and that any large catalog of musical instruments should in fact follow the aforementioned numerical system for ease of access (Baines and Wachsmann, 1961, p. 10). The Dewey Decimal System actually has its own system of identification of musical instruments within the 786, 787, 788 numerical headers that appears to be nearly identical to the Hornbostel-Sachs system. Looking at the piccolo (788.3) again, the progression would be:

- 700- Arts and recreation
 - 780- Music
 - 788- Wind instruments (aerophones)
 - 788.3- Flute family
 - 788.33- Piccolos and fifes (OCLC)

The Glenn-Bradley System; A Little Bit of Hornbostel-Sachs, A Little Bit of *bā yīn*

In creating my own system for categorizing musical instruments, I looked at both the Hornbostel-Sachs system and the historic *bā yīn* systems and identified portions of each that seemed to better delineate musical instruments into workable categories. The Hornbostel-Sachs system does a phenomenal job encompassing musical instruments from a variety of time periods and ethnic backgrounds, but does little to delineate between the nuanced differences that a change in material composition can bring about. I am a musician and am rather particular about the type of materials my instruments are constructed out of. There is a definite sound difference, for example, between a piccolo constructed of grenadilla wood versus one constructed from resin versus one constructed of sterling silver. The *bā yīn* system from China did an admirable job of identifying the materials instruments were constructed out of, but did little to take into consideration the manner in which sound is drawn from the instrument.

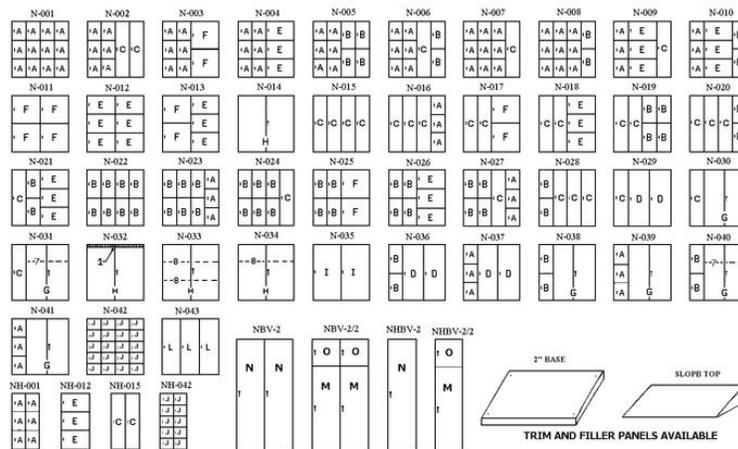
That being said, the Glenn-Bradley System of Musical Instrument Identification and Classification follows many of the same guidelines that the Hornbostel-Sachs system does, albeit simplified, but adds on identifiers for the type of materials used in the production of said instruments. It follows the following schematic:

Instrument Name Here

- I. Instrument type: (Human-powered versus electronically-powered)
 - A. Sound production mechanism: (air versus string versus percussive motion, etc.)
 - 1. Mechanism function: (air direction, how you interact with a string, etc.)
 - a) Physical characteristics: (with frets, with fingerholes, resonator tubes, etc.)
 - (1) Pitch: (C, B flat, etc.)
 - i) Range: (notation range if determinable, e.g. C4-C6, or descriptive term)
 - (1) Material construction: (wood, metal, leather, etc.)
- Location: (Actual physical location)

Storage of Materials

The manner in which musical instruments are stored is of the utmost importance. They need to be easily accessible yet protected, as many of them are delicate pieces of expensive tubing. Instruments should be stored in protective cases arranged by type, size, timbre, and material construction in sturdy cabinets or racks designed for said purpose.



Woodwind/brass/strings cabinet example layouts

(Image courtesy of the Woodwind-Brasswind catalog)

Conclusion

Music is an integral part of my life. I have played a variety of instruments for 20 years in orchestras, marching bands, chamber ensembles, and choir/quartet/quintet groups. Researching the history and current practices surrounding the classification and categorization of musical instruments was an exercise in formalizing what knowledge I already had (what with helping organize our college band's instrument library every summer and helping my father-in-law, a recently-retired high school band director, catalog his own slew of instruments) and applying the knowledge I have gained over the semester into a cohesive, descriptive methodology for properly describing musical instruments.

Works Cited

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Example One



(KG Professional Custom Piccolo, image courtesy of Woodwind Brasswind Catalog)

PICCOLO

II. Instrument type: **Human-powered**

A. Sound production mechanism: **Air**

1. Mechanism function: **Focused downward stream of air**

a) Physical characteristics: **With finger holes, closed keys**

(1) Pitch: **C**

(a) Range: **D5 to C8**

i) Material construction: **Grenadilla wood head, body, and headjoint, sterling silver keys with gold springs**

Location: **Cabinet 1, Row 1A, Madelon Library of Musical Instruments (Asheville, NC)**

Example Two



(Getzen 595 Capri Series B \flat Flugelhorn, image courtesy of the Woodwind Brasswind catalog)

FLUGELHORN

III. Instrument type: **Human-powered**

A. Sound production mechanism: **Air**

1. Mechanism function: **Concentrated stream of air into a mouthpiece**

a) Physical characteristics: **3 valves, conical bore, pitch can be altered through lip control**

(1) Pitch: **B \flat**

(a) Range: **F #3 to C6/7**

i) Material construction: **Nickel plated brass bell and leadpipe**

Location: **Cabinet 3, Row 7B, Madelon Library of Musical Instruments (Asheville, NC)**

Example Three



(Yamaha Standard Model AVA7 Viola, image courtesy of the Woodwind Brasswind catalog)

VIOLA

IV. Instrument type: **Human-powered**

A. Sound production mechanism: **String**

1. Mechanism function: **Drawn bow across hollow bodied construction**

a) Physical characteristics: **Four tuned strings, adjustable frets**

(1) Pitch: **C3-D3-G4-A4**

(a) Range: **C3 to E7**

i) Material construction: **Spruce top, seasoned maple neck, back & sides, ebony fittings**

Location: **Cabinet 5, Row 8I, Madelon Library of Musical Instruments (Asheville, NC)**

Example Four



(Yamaha YAMAHA YV-3910C Professional 3.5 Octave Gold Gloss Vibraphone, image courtesy of the Woodwind

Brasswind Catalog

VIBRAPHONE

V. Instrument type: **Human-powered**

A. Sound production mechanism: **Percussive**

1. Mechanism function: **Resonator tube beneath tuned bar with a motor-driven butterfly valve at its upper end**

a) Physical characteristics: **Tube resonators, butterfly valve operated by pedal**

(1) Pitch: **Keyed**

(a) Range: **C3 to F6**

i) Material construction: **Yellow brass construction with steel frame**

Location: **Percussion Closet, freestanding, Madelon Library of Musical Instruments (Asheville, NC)**

Example Five



(Schalloch Bamboo Didgeridoo, image courtesy of the Woodwind Brasswind catalog)

DIGERIDOO

VI. Instrument type: **Human-powered**

A. Sound production mechanism: **Air**

1. Mechanism function: **Focused stream of air blown straight through a tubular carved mouthpiece**

a) Physical characteristics: **Tubular construction, pitch changed by lip tightening**

(1) Pitch: **N/A, no native pitch given**

(a) Range: **F #3 to C6**

i) Material construction: **Carved bamboo body**

Location: **Percussion Closet, Cabinet 1, Rack 5A, Madelon Library of Musical Instruments (Asheville, NC)**