UDC 78.01+785

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CONCERNING THE ISSUE OF MUSICAL INSTRUMENT CLASSIFICATION

This article emphasizes importance and necessity in studying musical instruments in tight correlation with play-thinking, spatial playing modes, playing orientation in the instrument space and form of playing motions.

Keywords: musical instrument, classification, thinking by "instrument space", playing approach.

The classification of musical instruments occupies the minds of researchers for a long time (one of the first such efforts was made in the ancient China). It may be based on different criteria - material of the body, neck, frame; the sound source; construction of the instrument; method of sound; genre and stylistic criteria of played music; range; role of the instrument in orchestra or band; historical, mythological and spiritual, moral aspects etc. Authors of the most common classification, E. Hornbostel and C. Sachs, see as the most interested in ordering such organization, first of all, "music historians, ethnographers and custodians of historical and cultural collections" [12, page 229]. But the ancient philosophers and researchers, as well as musical instrument researchers usually do not take into account the playing component of musical instruments - without which its being (i.e., live sound which embodies the meanings) loses all meaning. Without claiming on revolutionary nature of this approach, let us try to make some clarifications to the current order of musical instrument classification.

There were many attempts with varying degrees of accuracy to systematize musical instruments in the history of world cultures. Not all of them look like scientific, versatile and comfortable (first these goals did not exist at all), because they often had no uniform criteria for differentiation and association of instruments to relevant groups. V. Ya. Propp insists on the need for and establishment of a classification for the leading constant clear signs when using only one reception in the same category (class, genus, species) [11, page 76]. In a difficult and long way of musical instrument classification at different times and in different ethnic layers there may be distinguished different criteria and approaches. For example, in the ancient China, formation of a kind of musical instrument classification system ("Baiyin") matched the material of construction instruments, therefore the instruments were divided into eight classes: stone, metal, copper, wood, leather, pumpkin, earth (clay) and silk. However, such classification under materials has a distinct ideological and symbolic feature which meets ancient philosophical and ideological traditions of China. For example, a recorder

made of jasper, symbolized quiet sadness. Rhythmic playing pattern on a stone or jade schitsin (percussion instrument) was a symbol of clarity: it was used for accompanying while making the wisest decisions. Sounds of copper bell (juna) accompanied declaring orders of the governors, i.e. reflected boldly-military features of its life. Wooden flute reflected the harmony of life (opposite to the eastern Greek understanding of pipes as carriers of earth entertainment). Thus, the above classification is based on Chinese philosophical fine art nuances, as reflected in the sensory perception of different sounds, "reasonable material" of the instrument in its relationship with the phenomenon of nature, cardinal, season, parts of the human body, allegory with animals etc. The Arab, Indian and Tibetan classification of instruments reflects principles of group differentiation in sound source; while in African cultures classification is based on on functional grounds, tone-performance, feature of the instrument in the band, even in size [6, page 9].

In the ancient Greece there was a well-known distribution on strings - class of citharistics, citharody (Apollo-like, sublime, divine) and pipes - class of auletics, aulody (Dionysus-like, sensual, low) as well as drums. Unique advantage of strings as training, harmonizing and bringing soul timbre is based on moral and symbolic mythological aspect. Thus, the classification of instruments is the most important impact in the lives of the ancient Greeks on philosophical and moral basis. The same classes are actually specified in the Bible (Psalms: "To Chief Musician - strings", "To Chief Musician - pipes" [2, page 536-538], "in the midst of maidens with tambourines" - Psalms 67: 26). In fact the Bible mentions in different situations lots of instruments, each acting as the mouthpiece of a mood, status, carrier of the information, function definition (in worship, in celebrations, in the campaign, battle, funeral or other life-spiritual situations). The Roman philosopher and lexicographer Cassiodorus (IV-V centuries) indicates percussion, strings and pipes (in that order).

Medieval classification also specifies the bovetriad (Regina of Pryum - X century. Isidore of Seville - VII century. Walafrid Strabo - IX century [5, page 29-32], Hafuriusa - XV century [Maykap], etc.). The above classes (strings, pipes, percussion) have been actually preserved in today popular classifications with extension (for example, electronic instruments) or some transformation. Thus, the classification principle of sound sources formed in the early twentieth century serves as the most widespread basis for classification (Hornbostel - Sachs) on a long-time base, no doubt, due to music practice.

However, some scientists of antiquity and the Middle Ages exclude certain instruments from their classification at all. For example in the encyclopedia of Julia Pollux «Onomasticon» (II century) there is division only to percussion (including strings) and pipes (i.e. based on the means of sound); in Boethius (VI century) and Avicenna (XI century) instruments are divided into pluck strings, percussion and pipes (bow strings were not considered at all). Treatise of Sebastian Virdunga «Musica getutsch und ausgezogen...» ("Music, studied and summarized...") in early XVI century points out three groups quite unclearly: 1) strings (including keys, except organ); 2) driven by "blowing or whistling"; 3) "made of metal or other material sounding" (S. Levine), or even eight (N. Zeyfas) using different principles of classification [5, page 37]. Italian composer, theorist, singer and priest L. Tsakkoni (XVI-XVII centuries). "removed" percussions and divided other instruments into pipe, key, and bow instruments which may have been connected with his spiritual status (but the perfect aspect for our approach is highlighting pluck strings and keys). German composer, theorist and organist M. Pretorius («Suntagma musicum» - «The work of music", 1618) shared all the instruments in two groups only by the way of sound, but with the following fragmentation/complication of classification system: the spirit (mouthpiece and reed - on a constructive basis) and percussion including also strings (i.e. without bow strings). In terms of functional approach M. Pretorius shared also instruments on fundamental and entertaining. The Frenchman Marin Mersenne («Harmonie universelle», 1637) clearly classifies strings, keys and pipes. German musicologist of XVIII century Johann Mattheson, considering only orchestral instruments, could not ignore the total problem of classification for researches of XVI-XVIII centuries: scientist refers organ, piano, lute and similar instruments to the category of percussion (which is faced, as we see, quite often), allocates strings (chordata) and bows (fidicina), describes the brass (trumpet, trombone, French horn) and woodwinds (oboe, bassoon, flute) [5, page 55]. Thus, the classification of instruments in XVI-XVIII centuries was linked directly to the economy, advanced practice of orchestral compositions (the latter has also not been divided, as manifested first in the second half of XIX century in the Russian conservatory education), while non-orchestral (solo) instruments (Jan Stamitsa of Manheim excluded so-called fundamental keys from the orchestral treatment) and drums poorly used in the orchestra are often "dumped" into some general group. A similar idea was expressed in "Lectures on aesthetics" by G. Hegel in the first half of the XIX century, "as the basis unit of musical

instruments, he identifies "linear direction" - "associated air column" (the pipes) and "tightly stretched material pillar" (the strings)"; "space", in his opinion, "is provided by minor instruments only" (quoted by [5, page 65]).

Increased attention to timbre aspect of music from the beginning of the Romantic era initiates new classification processes of musical instrumentalism. The central position of "romantic" classification of instruments is denominated in the researches by H. Berlioz and F. Hevart. While the first one offers quite conditional classification (giving a comprehensive description of individual instruments), the second one (Tchaikovsky translated "Guide to the instrumentation" by F. Hevart in Russian in 1866 with its own comments, giving an advantage thereto over the more famous "Treatise" by H. Berlioz [3] issued 20 years before) offers quite a clear systematic division of instruments into strings (bow and pluck), pipes (woodwinds and brass), drums ("with tight skin" and "metal") - clearly considering orchestral practice, but also distinguishes keys - string (piano), pipe (organ, harmonium) [5, page 78]. Among other important didactic information Hevart announced on functional equality of strings and brass, called by O. Polotska following G. Banshchikov as "horizontal concept of orchestral thinking" [10] (undoubtedly, under the impact on solo instrumentalism of romantic era). In the framework of F. Hevart system, A. Gumenyuk describes the Ukrainian folk instruments in the early XX century [4]. Classification of musical instruments by Hevart, which became one of the foundations of modern European scientific taxonomy of musical instruments, is based on "way of sound extraction."

In "Principles of orchestration" by Rimsky-Korsakov (1891) expressed opportunities of orchestral groups are featurized virtually by certain order of instrument classification: bow-string group released features melodiousness and expressiveness, woodwinds are "colorful" (based on a clear classification - generic and specific instruments, instruments of nasal and chest tones, as well as the concept of "distinct game sphere"), brass feature strength, large equity scale and timbre unity of each individual instrument, while percussion instruments have certain and uncertain height; pluck group is also differentiated. Thus, instruments are classified as "the ability to brilliance and expressiveness," through the concept of "distinct game sphere" [5, page 95] is based on composer methods. Features of the instruments are not limited to identification of their technical and artistic possibilities and are based on the doctrine of timbres.

The first scientific classification of musical instruments is the system presented by V. Mayonne in 1893 on the grounds of studying his own collection and a large collection of the Museum of Musical Instruments of the Royal Conservatory of Brussels, where he was the keeper [6], advanced by Austrian scientist E. Hornbostel together with the German musicologist Karl Sachs in 1914. Mayonne introduced the following designations as class, branch, section, subsection (similar to biological science, without advice of Hevart concerning "family" used for a long time in organology for instruments of various sizes and settings, but the same design). Classification by V. Mayonne is based on "sonorous fluctuating body", i.e. direct sound source - the only criterion under which the scientist identified four categories (groups) of instruments: autophones (idiophones) - self-sounding, membranophones - containing diaphragm membrane, chordophones - with strings and aerophones - pipes. This classification served as basis and was further developed and systematically detailed by E.M. von Hornbostel and C. Sachs, proposing quite a complex and detailed internal classification. However, this divergence (with regards to complexity of the instrument individual features) is based on several criteria - the sound source, the method of sound production, structural features (for example, the correlation between string-bearer and resonator), playing methods etc. The finding of researchers was application of the Dewey brilliant digital system to the classification of musical instruments, which provides instead of the usual combinations of numbers, letters and double letters the use of decimal fractions only, wherein each subsequent unit may be numbered, deputed to the end of the row to the right. So there is the possibility both to continue differentiation, and to establish, as per position and dignity of the latest figures, a logical bit position in the system, and to use dots for connecting a group of any number of sign positions. Self-sounding instruments include the following: fluctuating by strike, pinch of mouth harp tongues or bars, friction, blowing on the rod or plate. Membranophones - by strike, pinching the strings under the membrane, friction or singing/pronouncing towards membrane. Chordophones provide the sound producing method within so-called "common final unit marks" (hammers, fingers, rubbing, mediators, bow, wheel, keyboard, mechanical appliances etc.), i.e. not the second series of numbers, but further, followed by dot(s); in the second row of numbers appears a constructive sign of communication between string-bearer and resonator. The same relates to aerophones - in the second row there is a sign of restricting / non-restricting air column by the instrument or part thereof, followed by whistle, reed and mouthpiece types, with final

signs of subdivision - air, flexible, tough tank, valve / tape mechanism, keyboard, mechanical drive. Thus, the classification system by Hornbostel - Sachs combines multiple principles. Such contamination, as stated by the authors themselves, is deemed as "trouble for systematizers" and reflects the inevitable arbitrariness of classifications due to growth/shift of phenomena and static systems where, for example, the instrument must "be attributed to two (or more) groups" [12, page 229]. Therefore, the authors "deliberately failed to divide the various groups under single principle" but adapted "to the identity of this group" suitable for "collections and catalogs", "curators of museums and researchers" (without taking into consideration executive thinking by "instrument space"), but without ruling out further permutation of bit sequence, creating new units and including new features. All this under fully verified consistency and versatility gives rise to criticize classification introduced by Hornbostel - Sachs.

N.P. Zimin was one of the first who introduced it. He proposed two-coordinate featuring system - acoustic (solid body and gas volume) and functional (in relation to nature, human and mechanical strength) [8]. In 1932, the Frenchman A. Cheffner used another method of classification for the convenience of describing non-European instruments: all chordophones with strings along resonator and neck - type of lute; strings along resonator only - type of guitar; lute-bow – type of fiddle ("violin") etc.; idiophone with bell pendants - type of sistra etc. His classification of the XX century was also advanced by H.H. Drehher, F. Helpin, N. Bessaraboff (USA), A. Modr, A. Buchner, A. Elshek (Czech Republic), H. Dev (India), J. Montague and J. Burton (UK), A.V. Hordienko, V. Biberhan (Russia) and others. In the second half of the XX century there was a proposal to introduce a new class - electrophone (with broken logics of "sound source" but reflecting the system trends).

A very interesting variant classification is offered by S. Muratov [8] (author of the article highlights the acclaimed playing base), bringing to the fore three criteria (in violation of the Propp principle) - sound extraction method, resonator and the sound source (the latter is also criticized by the author as provoking the occurrence of "a series of completely different instruments under their design and under musical and artistic content" [8]). The primary level of classification is based on four sound extraction methods (hitting, pinching, rubbing and blowing, which raise at once the problem of combined instruments and combination of strokes and techniques, e.g. among stings players) with formation of respective classes and with consideration of playing techniques (by hand, simple touching,

mechanics in the first three forms and blowing the instrument, blowing into tank, with pneumatics – for pipes). Brilliant finding of S. Muratov assumes the use two main types of resonators with relevant subclasses with the possibility to extend the list without breaking the table – with integration / differentiation of instruments in their individual capacity (an important feature as of today).

In general, it is a slim, hierarchical and not very "heavy" system (from 4 to 10 levels with fast finding versatile and original correlations) but "faces a problem" of complex modern instrumental playing techniques. For example, what about the common pizzicato (plucking) in the so-called «friction» (more known as bow strings) and vice versa - with tremolo (frequent multiple strikes up/down, not pinching as another method) in plucked strings which is used in fact as friction principle of string vibrations? In order to avoid "mixing in one group of unrelated instruments" (on which grounds? There are lots of them), S. Muratov places in the single class (friction) glass harmonica and violin, but location of the glass harmonica hemispheres imitates the "piano" keyboard sequence on the basis of the fixed-modus instrument while timbre of glass source is certainly dissimilar to violin (timbre approach in XX, as stated by B. Asafyev, faced an unusual growth and development). Music Box treated as a plucked string, in our opinion, is not an instrument but mechanical toy, construction etc., because there is no live player bringing the "live" sense of playing. S. Muratov, a violinist, has an approach for classification from the point of view of a music master, in terms of organology: having criticized classification by Modr, he observes correctly: "If the neck is involved in the tone-changing sound of the string, the keyboard is part of the mechanics driving a plucking or hammer mechanism" [8]. But for player (for example, if necessary or desirable to play another instrument) there are extremely important, in our view, spatial and instrumental parameters of sound (hitting, pinching, striking by means of bow or mediator, spatial orientation on the playground of instrument, coordination of both hands or hands with mouthpiece, the way precedence) and sound driving (bow driving or tremolo in playing long notes and cantilena structures, respiration rate), used for representing his own idea of playing art – i.e. playing criteria related to instrumental thinking - "thinking by means of instrument". Of course, in terms of a universal classification system, organ and accordion (with piano keyboard) belong to pipes and piano belongs to percussion. However, from the standpoint of playing and instrumental thinking by means of "instrument space", textured way, shapes and kinematics of playing motions - they are more correlated

than, for example, piano and xylophone or flute and accordion. Composer (and partially audience) are rather important aspect of timbral affinity, articulatory, dynamic and textural (including today resonant) capabilities – i.e. criteria related to composer thinking, common sound imagery and spatial-artistic component. However, the difficulty (almost impossibility) to classify "complex" (concert, improved and some specific folk) instruments with regards to reloadable infinite number of criteria and principles had been already pointed out by Hornbostel and Sachs. In the playing practice there is own series of "relationship" based on kinematics mastery of playing motions and articulatory-texture-spatial thinking, initiating for the last decade new language techniques and even idea-bearing voice projections.

Professional routine classification of instruments (and artists) in a musical environment from the beginning is associated primarily with their practical activities in the current forms of bands (formed by the tone-functional principle of relationship / contrast), pipes (pipe players) strings - bow and plucked (string players), drums - in the whole variety (percussionists), keys (pianists, keyboard players), from actualization of popular and mass ("third" by W. Conen) layer - bass (bass guitarists). Somewhat apart in the routine playing classification are accordionists - playing the pneumatic key instruments of complex design improved only in the middle XX century: they are often called accordionists or even folk instrument players (generic name all the improved and academized folk instrument players, including pluck strings - domra, balalaika, bandura). Nearly in the same vein there were traditionally formed respective departments in specialized music educational institutions of all three stages. In such routine playing classification, except historical and orchestral parameter, there is the easily visible relationship with technique and technology of playing the instrument and affinity of playing forms and techniques (including quick development of practical learning to play the related instruments under that feature) , i.e. with the play thinking in "instrument space" or even with "instrument space" itself (e.g. piano-harpsichord-organ-accordion, violin-viola-cello-double bass, balalaika-domra-guitar etc.). Thus, N.A. Berger indicates "proper instrument installations in mastering keyboard and reading piano scores as a prerequisite for mastering the musical alphabet", confirming "the concepts of equality spatial and temporal forms" [1, page 10-11]. She highlights the ideas "of the components of music, from the first moments of playing deduce the process participant to auditory-motion sensations and ensure mobility of his/her thinking in different kinds of music" [1, page 11]. In such case playing process "requires for extrageneous behavior of the

musician" (D. Uznadze), which consists of "thinking warning factors" (S. Maltsev). Here is the most important designated relationship between playing motions and techniques in various scientific classifications of instruments. This deliberate formation of "hands that hearing" (auditory-motion images) is combined with transfer from private to general and vice versa. Visual representation of the spatial shape of music height demonstration activates thinking of people, significantly increasing the capacity of perception. For example, the playing area of piano keyboard creates specific prerequisites "to include "architecture-designed" key blocks into work as aesthetic objects" [1, page 25], while music for piano is able to transform into "auditory-motion images up to the emergence of new sound effects, confirming its artistic value" [1, page 26], which applies to all the key instruments with piano-like black and white keyboard (and not only).

A similar view is expressed by G. Orlov, stating that European consciousness and thinking of "sound structure" as " chains of interconnected structural unity" (with its height, register, duration, loudness-dynamics, texture, timbre, functional and hierarchical features) are more full of meaning than "observation over change regularity" [9, page 55] (in our view, they are interrelated processes). But it would be wrong to ignore the above component of integral process of musical thinking, determined by G. Orlov as "spatial-measured operating time prevailing over some space of thinking" where the abovementioned objects are placed, correlated, transformed etc. This "project" space is stored in memory with the ability to identify new and traditional correlations. For European music system, in the opinion of G. Orlov, "lattice of predefined heights is deeply absorbed in learning process" and is canonized by "system of five-line notation" (as well as instrumental tablatures as certain "cards" of finger motions on keyboard or neck of the instrument) and "polyphonic instrument structure". Keyboard (and neck) is the "visible" tangible equivalent of this "lattice" [9, page 58].

Such spatial-temporal processes (already with their own specifications) are set up in lots of necked or polychord plucked, bow, pipe instruments. Percussions, varied in tone and sound-creating qualities, are combined not only by spatial-orientation characteristics but also by correlated forms of playing motions (rhythmic, including complex, beats, tremolo etc.) – either by fingers or by special devices (wands with different tips, hammers, brushes etc.) in direct contact with the sound source.

As we know, "the path to music" (L. Barenboim) includes, first of all, playing the music instrument (by the way, reflected in the methods of professional music education from ancient times to nowadays), ignoring these processes of orientation and forms motion forms (including the issue of instrument classification) would not be just unfair, but wrong in terms of integrity of the instrument-playing creative act as mental imagery and game complex. "The playing" informal classification of instruments - strings (bow, plucked, polychord), pipes (woodwinds and brass), percussion (including all types), keys (piano) – is based on the practice of live music, actually fit to the so-called most widespread (scientific) classification by Hornbostel - Sachs (the distinction between academic and playing classifications has been studied by E. Nazaykinskyy, referring first of all to the ability to "design widely used classifications of instruments under the orchestra structure, including so-called "percussive articulators", "intonators" and "resonators" [5, page 291]).

Overall today situation is still complicated by the principle of instrument classification: playing method, materials used in the manufacture of musical instruments, the sound source - inevitably enriched by functionality of the instrument, its social significance, nature and methods of instrumental playing techniques, scope of distribution, aesthetic-mythological references etc., but most importantly by powerful component of executive thinking involving mental-kinetic field as an aesthetic object - thinking in "instrument space" and "instrument space" itself.

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