https://doi.org/10.48417/technolang.2022.02.07
Research article

Staging Notations

Danil Vyrypanov (✉)
Peter the Great St. Petersburg Polytechnic University, St. Petersburg, Polytechnicheskaya, 29, 195251, Russia
vyrypanov.da@edu.spbstu.ru

Abstract

The paper examines the possibility of recording performances by analysing more than 10 types of notations (Lorin, Beauchamps-Feuillet, Tomlinson, Saint-Leon, Stepanov, Zorn, Sutton, Benesh, Ivanov, Varpakhovsky, Schreyer, Nikritin, Eshkol-Wachman and others). The paper foregrounds methods of fixing movements and sounds in space and time and the ways in which iconic and symbolic signs are used. Difficulties and solutions are highlighted, such as the transmission of 3D motion, changes simultaneously in space and time, the recording of the melody of speech or its volume, emotion, accent, speed, and so on. The notations for recording performances are specific languages that have a rich variability and can be written in letters, notes, lines, numbers and specific signs. However, there are no commonly used ways to fix the staged performance. In the face of technological recording tools it may seem that written notations are obsolete. However, technological tools do not only replace notation tools, they sometimes make them more useful. Another dimension of notation is the relation of recording to instructions. Due to the requirements of intellectual work, analysis and synthesis of elements, notation is in demand for digital human and unhuman learning or for creating three-dimensional animation.

Keywords: Notation; Graphic notation; Director's score; Performance; Ballet; Theater; Sign; Movement Analysis

Acknowledgment I would like to express my gratitude to Daria S. Bylieva for the idea and great help in the work. Thanks for participation to Nikita Pegov, Artem Martynov, Michael Artyukh, Daniil Fedotov, Artem Klyushin.

Citation: Vyrypanov, D. (2022). Staging Notations. *Technology and Language*, 3(2), 81-126. https://doi.org/10.48417/technolang.2022.02.07

УДК 792.021
https://doi.org/10.48417/technolang.2022.02.07
Научная статья

Запись постановки

Даниил Вырыпанов (✉)
Санкт-Петербургский политехнический университет Петра Великого, Политехническая, 29, 195251, Санкт-Петербург, Россия
vyrypanov.da@edu.spbstu.ru

Аннотация
В статье автор рассматривает возможность записи спектаклей. Проанализировано более 10 вариантов обозначений (Лорена, Бошана-Фейе, Томлинсона, Сен-Леона, Степанова, Цорна, Саттона, Бенеша, Иванова, Варпаховского, Шрейера, Никритина, Эшколя-Вахмана и др.). В статье рассматриваются способы фиксации движений и звуков в пространстве и времени, а также способы использования иконических и символических знаков. Выделены трудности и решения передачи объемного движения, изменения одновременно в пространстве и времени, указания мелодии речи, уровня громкости, эмоциональности, акцента, скорости речи и так далее. Формы записи спектакля – это специфические языки, которые имеют богатую вариативность и могут быть записаны буквами, нотами, линиями, цифрами и специфическими знаками. Однако общеупотребительных способов записать представление не существует. Также автор рассматривает технологические средства записи. Хотя технологические способы записи, кажется, делают нотацию устаревшей, на самом деле они не только не заменяют запись, но подчас делают ее более востребованной. Еще одним аспектом нотации является отношение фиксации к инструкциям. Благодаря интеллектуальной работе, анализу и синтезу, заключенной в записи, она используется для цифрового человеческого и нечеловеческого обучения или создания трехмерной анимации.

Ключевые слова: Запись; Графическая нотация; Режиссерская партитура; Представление, Балет; Театр; Знак; Анализ движения

Благодарность Выражаю благодарность Быльевой Дарье Сергеевне за идею и большую помощь в работе. Спасибо за участие в работе Пегову Никите, Мартынову Артему, Артюх Михаилу, Федотову Даниилу, Клюшеву Артему.

Для цитирования: Vyrypanov D. Staging Notations // Technology and Language. 2022. № 3(2). P. 81-126. https://doi.org/10.48417/technolang.2022.01.07

INTRODUCTION

Theater and ballet are synthetic genres whose action is created from many elements. Theater is one of the short-lived arts. Its length and repetition in time is relatively short. Before the advent of video, it was impossible to preserve what was happening on stage. But video can only partially convey a staging. As Leonid Varpahovsky (1978) points out, the director's score of *The Seagull*, composed by Konstantin Stanislavsky in 1898 for rehearsals which at one time were directed by Vladimir Nemirovich-Danchenko, is quite imperfect in its method of recording, but gives us more insight into Stanislavsky than many books written about him.

We are accustomed to look at well-staged theater and ballet productions, but do not muse how to record how the action should take place. The usual form of instruction for actors is verbalization. Obviously, the director explains in words and partly shows how the action should take place. But there are many reasons for the need to record how things should be done, and verbal description is too cumbersome and irrelevant, so various ways of recording were invented, new semiotic systems that made it easier to understand the intention and the way things should be done.

What exactly should be recorded? Broadly speaking, one can divide the action into what the eye sees and what the ear hears – movement and sound. Although words have been used from the beginning to describe both, they are superfluous intermediaries. This is how ways of recording human movement arise. Notation, be it choreographic or even musical, makes it possible to formalize and transcribe in a conventional form (established by a code) the components of a work (Bianchini et al., 2016). In addition, there is the need to represent movement across the stage. It is more problematic to convey any expressive components, such as speed of movement or type of gait. As for music, it has its own notation system, lyrics can be written in words, so it would appear that there are no problems in capturing the sound. It seems to be easy to record the rhythm, because it is just a text, but how to record intonation or a pause, and how long does it last? In addition, the two components: the visceral and the auditory are linked. In dance notation this is especially noticeable. As noted by Guest (1990):

> The parts of the body in action have to be defined, as does the form of movement involved (flexion, extension, rotation, directional placement) and the duration of each in relation to the overall time structure. In group dances the relationship of dancers to one another must be determined and recorded, as well as their location on stage and their paths of travel. In a dance score each performer is like a small orchestra-arms, legs, head, torso, etc. in motion-this is then multiplied by the number of dancers who are performing individual sequence. (p. 203)

At the same time, while there are a number of contemporary studies on various aspects of dance notation (Challet-Haas, 2016; Franko & Nicifero, 2018; Russell, 2020), the ways in which theatrical productions are recorded have not been sufficiently studied.

RECORDING OF MOVEMENTS AND SOUNDS IN SPACE AND TIME

Movements can be recorded in various ways, for example, on paper, in sculpture. For example, it is believed that the ancient Egyptians used hieroglyphs for this purpose. In the temples of South India there are preserved sculptural representations of 108 karans, the basic provisions of the Indian classical dance (fig. 1). The Romans used a system of recording gestures used in pantomime.

Figure 1. Shiva dance poses. Fragment of exposition 108 Karana Nataraja in the Saivite temple Kadavul (Kauai island, Hawaiian archipelago)

At the same time, the recordings used to record performances are usually not just images of body movements. As a rule, they demonstrate "two dimensions" – either changes of movement in time/music or in space. In the latter case the emphasis can be placed on the description of movements as well as on movement, and in the case of a complex composition on the location of all the actors.

Place, movement, relocation in a production

Records of dances have been preserved since ancient times. In Chinese notation, the feet were marked in a square divided into sectors to demonstrate the positions of the feet and the spaces through which they moved (fig. 2)

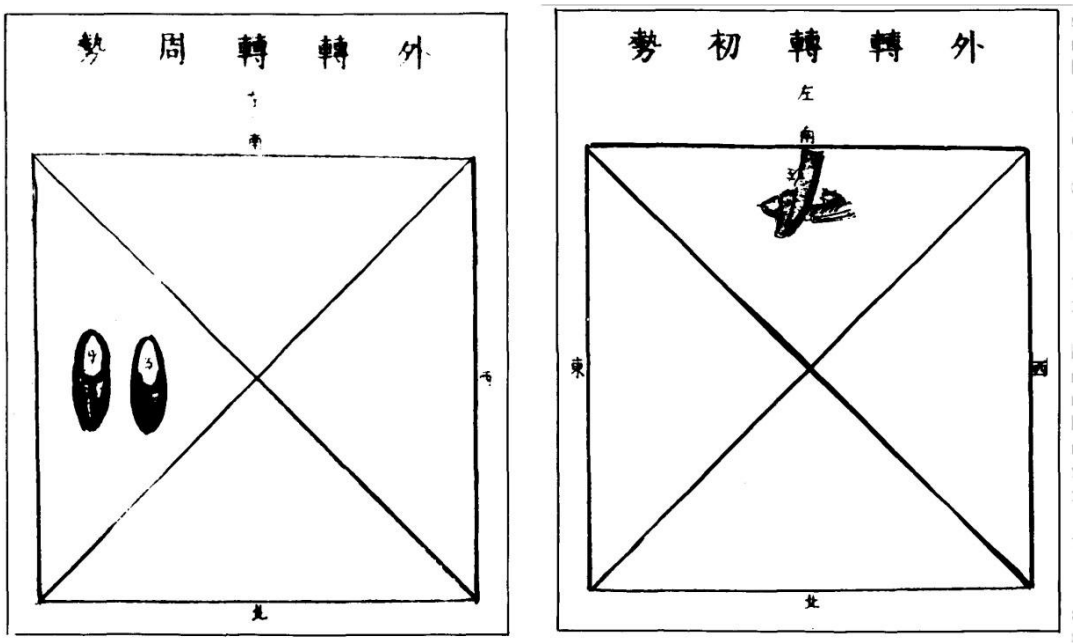


Figure 2. Non-sequential diagrams of foot movements in Ming dynasty ritual dance (Strauss et al., 1977, p. 6)

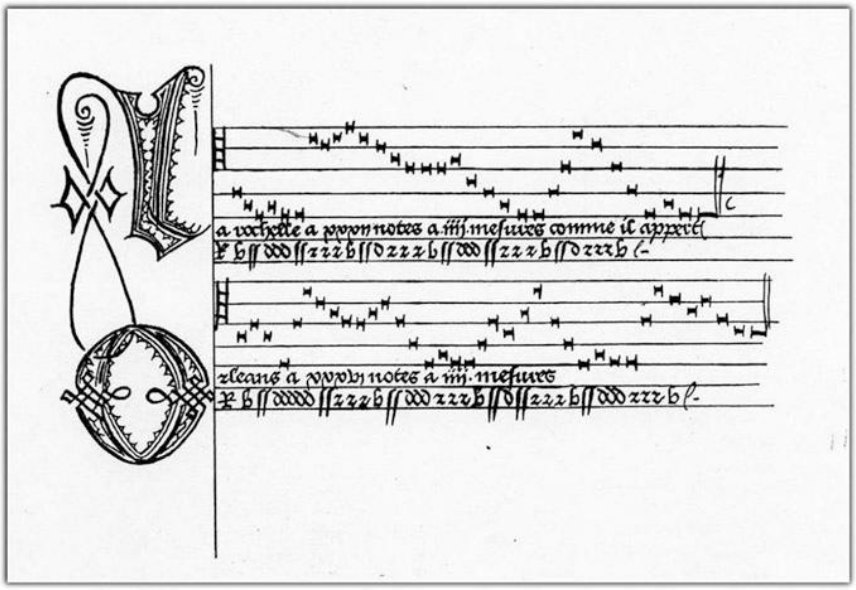


Figure 3. Manuscript of the Library of Burgundy circa 1450 (Challet-Haas, 2016, p. 70)

In XIV–XV in Europe, for recording the popular basse danses (“low dances”). letters were used to denote a certain type of step: s for simple, d for double, b for branle, r for reprise, R for reverence (fig. 3). Thoinot Arbeau (1589/1967) in his book *Orchesographie* didn't use any symbols, but placed the names of the movements next to the vertically arranged music.

In 1686, André Lorin described how to dance the country dances he had learned during his stay in England for the king (fig. 4). Letters means dance steps, line shows the floor route (Esses, 1992).

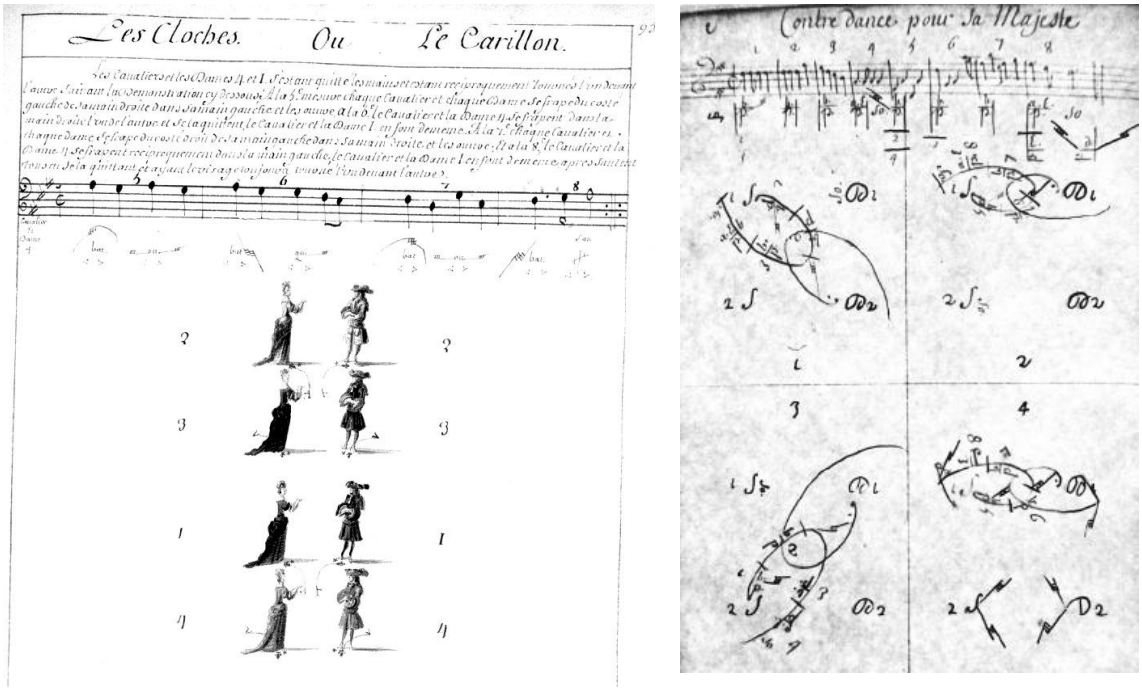


Figure 4. Notation of country dances by André Lorin (1686)

One of the most famous examples of eighteenth-century visual notation is the way of recording Beauchamp-Feuillet, an explanation of which is contained in the book *Choregraphie ou I 'Art de Decrire La Danse*. It was invented in the 1680s by Pierre Beauchamp and published in 1700 by Raoul Auger Feuille. It mainly demonstrates the line of motion in space during movement. Beauchamp-Feuillet represented French noble style of dancing (and some aspects of character or grotesque dancing). When the style lost its actuality, this type of notation also became a thing of the past. Exploring ‚*Menuet performed' by Mrs Santlow* in Beauchamps-Feuillet notation (fig. 5), Dóra Kiss (2014) claims that this “Menuet” is a piece whose writing is an act of encoding, not of composition, citing the form of the minuet since it borrows its steps and alludes to its figures; however, *Mrs Santlow* never quotes it verbatim. Reinvented from a material, the choreography nevertheless "leads" its audience by a calm introduction, multiple variations of known motifs, then regular repetitions of lexical and structural elements so as to prevent the audience from losing their way, Thus the interest of the latter is

maintained by surprises. It seems that the form of the "Menuet" does not apply any rule, but on the contrary is similar to an improvisation that would have been transcribed (Kiss, 2014).

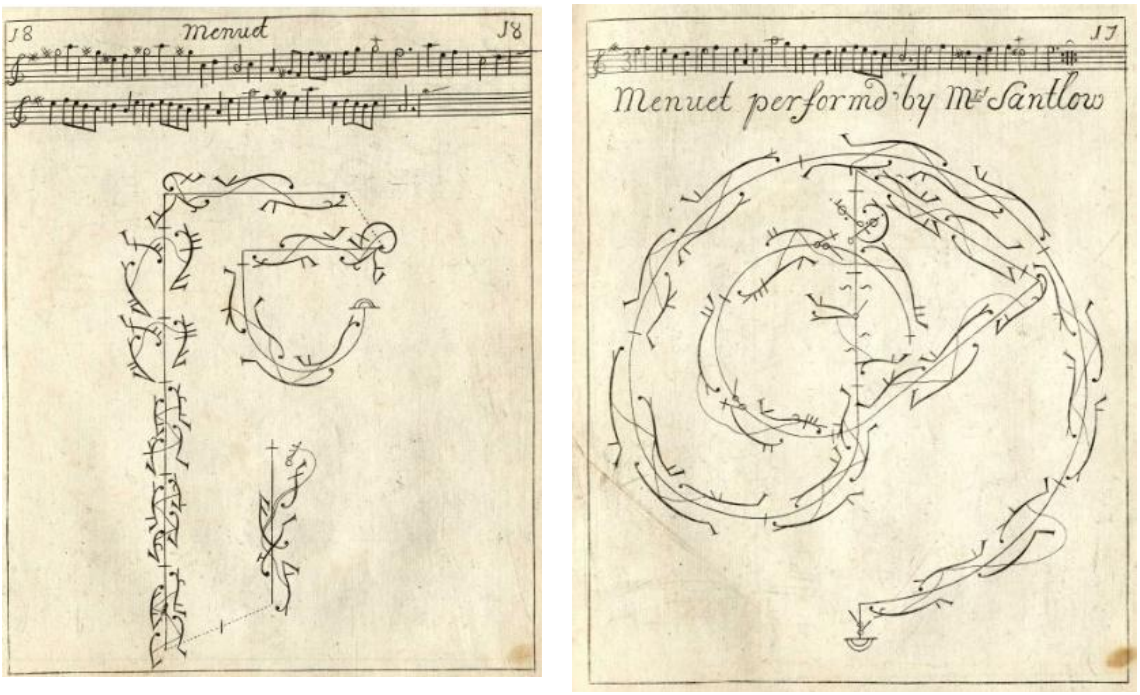


Figure 52. *Menuet performd by Mrs Santlow* by Beauchamps-Feuillet notation. The copy of this choreographic score comes from the Derra de Moroda Library in Salzburg (L'Abbe, 1725/1991, p. 18, 17)

In Figure 6 a male dancer on the left and a female on the right begin upstage, facing downstage. in the first moments of this dance, the couple starts with feet at different angles, with the heel of the back foot touching the floor. time value is indicated by lines that cross over the central line of direction Heyward (2015). This recording required prior preparation for understanding (in particular the relationship of movements to the notes at the top) from other sources or with the help of tutors, in addition captures only part of the movements, in particular there are no hand movements. As noted by Linda Tomko (1999), "One had to have recourse to other period documents to grasp that initial bends in dance step-units should be taken on the upbeats for musical measures, and not on the downbeats, as the notation would seem to indicate" (p. 3).

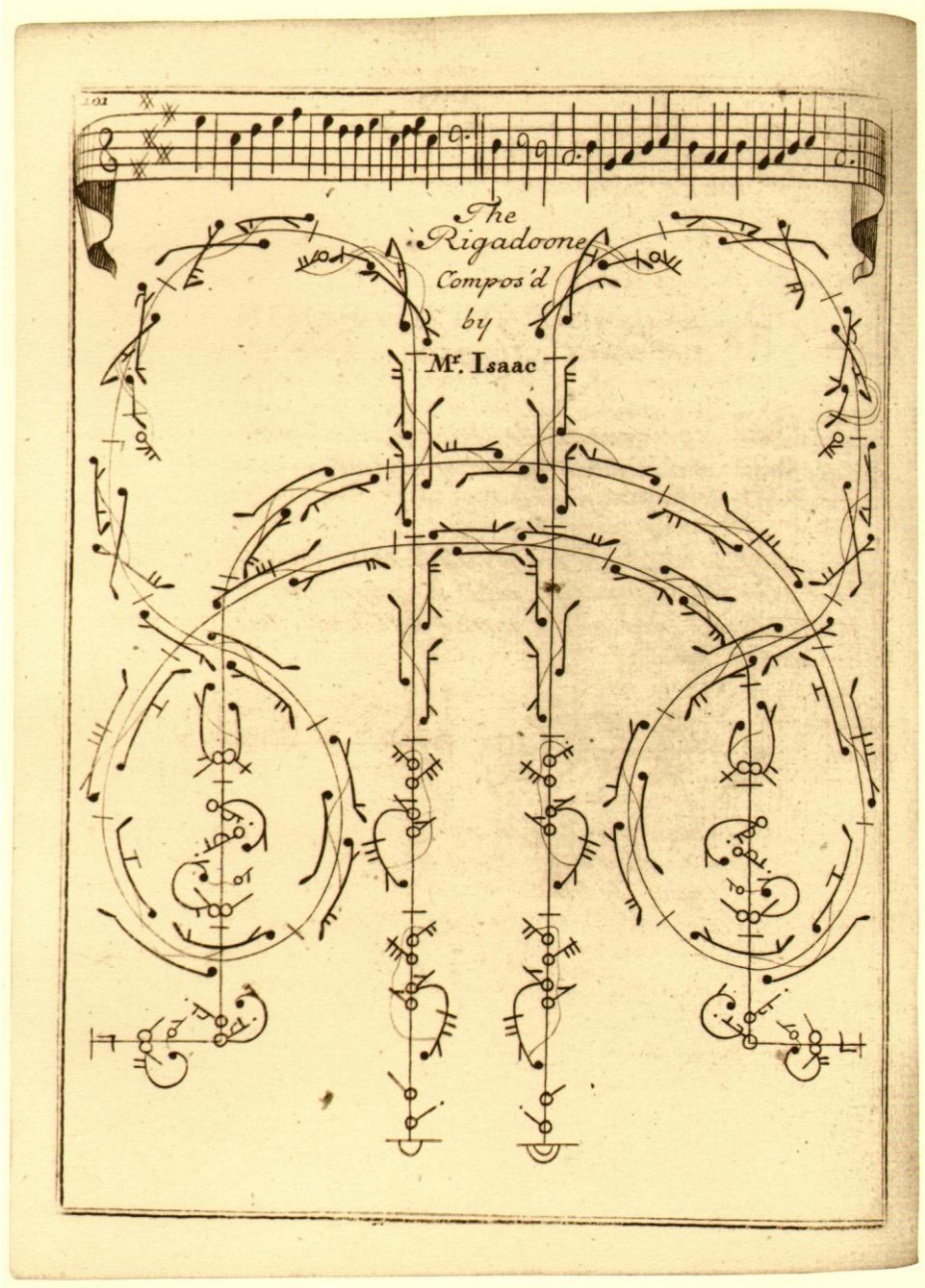


Figure 6. Beauchamp-Feuillet 's dance notation for a rigadoon by Isaac, ca. 1721 (Feuillet, 1721/2018)

Kellom Tomlinson (1735) wanted to revive Fueillet notations for his students by placing the figures of dancers in the list (fig. 7). He united a symbolic notation style and tradition of artistic visualization of pose dancers (like in Thoinot Arbeau (1589/1967) *Orchesographie*, Fabritio Caroso's (1581/1983*) Il ballarino* and Cesare Negri's (1602) *Le Gratie d'Amore*).

Figure 7. Tomlinson's (1735) dance notation for *Saraband*.

In the case of complex compositions, the picture above all shows the location of the actors. For example, figure 8 is a layout plan for the ballet *Amor*, and the displacement is indicated by dashed lines (fig. 8):

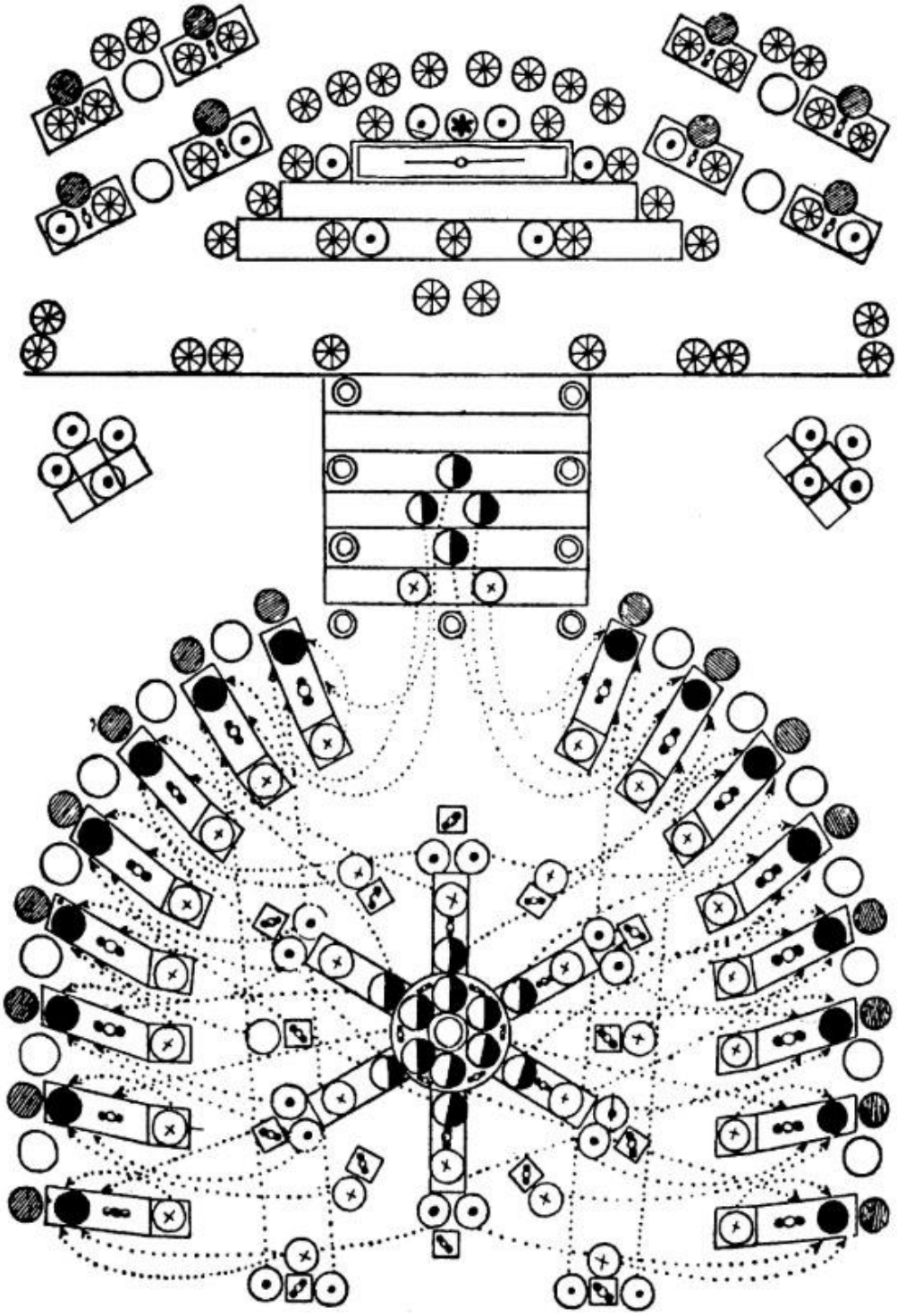


Figure 8. Choreography for the ballet *Amor*, floor plan by Luigi Manzotti, 1890 (Guest, 1990, p. 208)

In their work with music, choreographers often sought to use the stanza as the basis for notation in its various meanings. This is the case, for example, of Arthur Saint-Léon's (1852) notation system in his book *Sceno-Réography, or The Art of Recording Dance*. (*La Sténochorégraphie, ou l'art de noter promptement la danse*). The choreographer used a pentatonic easel connected to the sheet music staff. On the note staff line, he recorded the movement on the ground; above – in the air – the upper sixth line was used to convey the movement of the body and arms. The latter were depicted visually accurately, and a system of symbols was used for the lower part (fig. 9). The staff was useful, since horizontal display on the floor was no longer enough, arm movements, the height of the leaps, the elevation of the legs from the ground were more in demand.

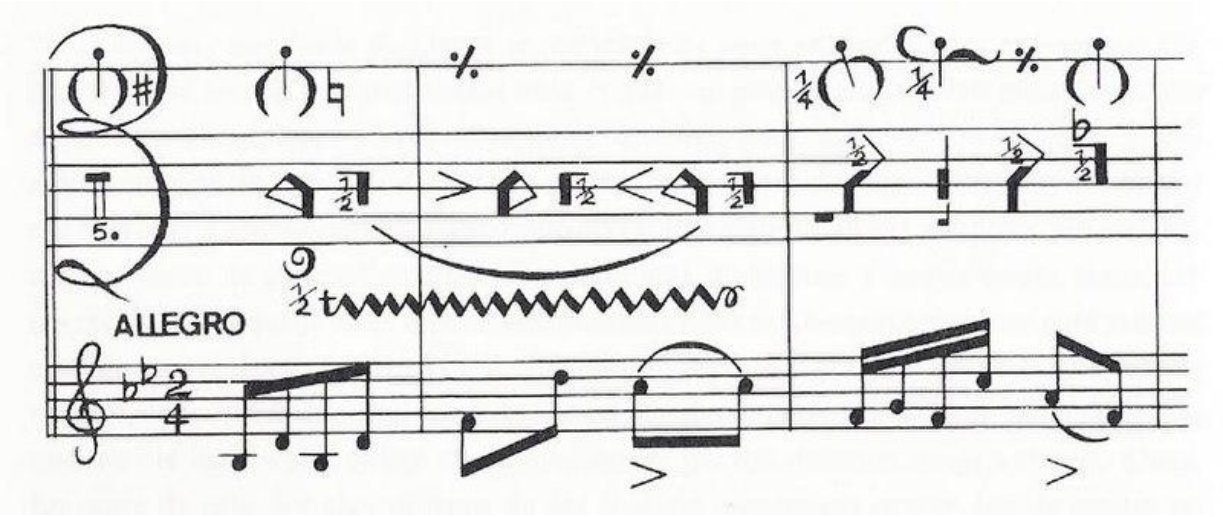


Figure 9. Saint-Leon (1852) notation

Jean-Étienne Despréaux decided to divide notations into analytical one (extremely detailed and organized into systematic classifications that have a primarily didactic function), and abbreviated one in which the dance is transcribed under the musical staff like the sung text. The symbols are adapted from three letters of the alphabet, Z, L, J, whose shapes reflect the lines assumed by the legs in the basic positions: respectively those of *plié*, stretched, and *sur la demi-pointe*. Letters are used also to indicate the directions of the movements of body and leg (forewards, sideways, backwards) but also for certain abbreviations (e.g. Pir for pirouette) (Pappacena, 2004, p. 63).

Sketches by Marius Petipa (fig. 10), chief ballet master of the Russian Imperial Theaters from 1869 to 1903, also primarily emphasize positioning, but contain many comments on movement both verbal and symbolic. Figure 10 shows the recording of body movements and how extremely rich it is in different types of signs: words, drawings, symbols, and numbers are used here. At the same time, two tendencies can be traced in the field of recording body movements: either to present them in the most

obvious way, understandable to all (iconic signs), or to develop a system of signs (simulative signs).

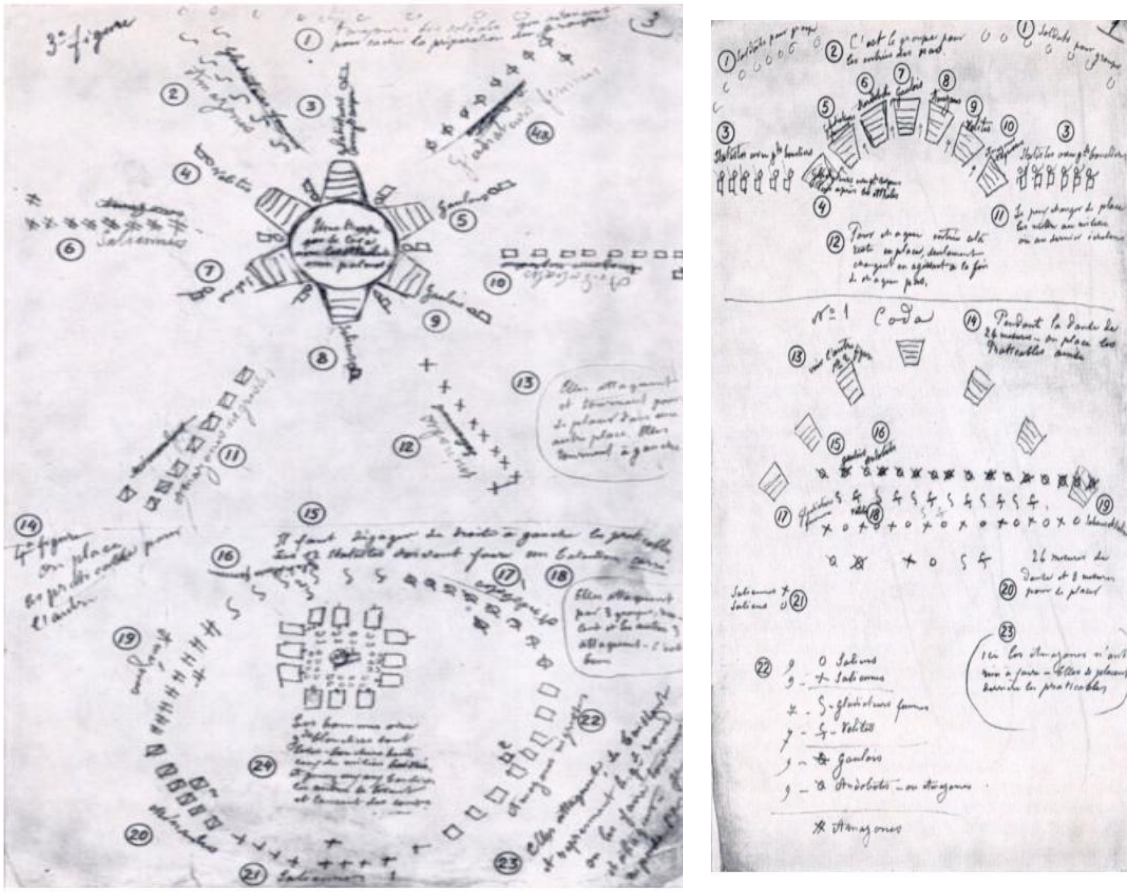


Figure 10. Sketch of a scene in a ballet by Marius Petipa, 1868 (Petipa, 1971).

Functioning like musical notes, these notations are not just records of a performance but instructions for its reproduction. If the records were used only "for oneself," then there was no question if portability in an saunambiguous and clearly decipherable system of notation. It was easier and faster for choreographers to write names or abbreviations of movements over the notes, explaining them with drawings and their own signs. As a rule, the question of exact recording arose when it became necessary to accurately capture the representation for restaging. Marius Petipa instructed in the literal and accurate reproduction of his productions. Therefore, the recording system for the ballet, proposed by the young corps de ballet dancer of the Mariinsky Theater Vladimir Stepanov (1892), and presented in the book in *L'Alphabet des Mouvements du Corps Humain (The Alphabet of Movements of the Human Body*) in Paris in 1892, was accepted by the Directorate of the Imperial Theaters as basic.

Stepanov's system of choreographic recording seeks to streamline the way of recording, again making references to music recording. The type of recording – three

musical-like notation stanzas: the lower one for foot movements, the middle one for arms, and the upper one for head and body – reminded some of notations for bell-ringing (and perhaps was prompted by them). Notes and additional signs indicated the positions of the body, so the system did not depend on the terminology (Fig 11). The symbolism of the notation is rich, the numbers indicating the turns, their position indicating the movement during them, symbols similar to music notes with streaks around them showing arm movements at certain beats.

Also Stepanov bases his notation system on an understanding of the anatomical structure of the human body. A modified musical staff provides sections on which to indicate movements of the legs, arms, body and head: Square headed music notes indicate steps in contact with the ground whereas round headed notes indicate leg gestures (figure 12). Note stems that go upward represent the left leg or arm; note stems going down the right leg or arm. Additional notations on the stem indicate movements involving flexion, extension, adduction, abduction, twisting, turns and circular movements (Farnell, 1996).

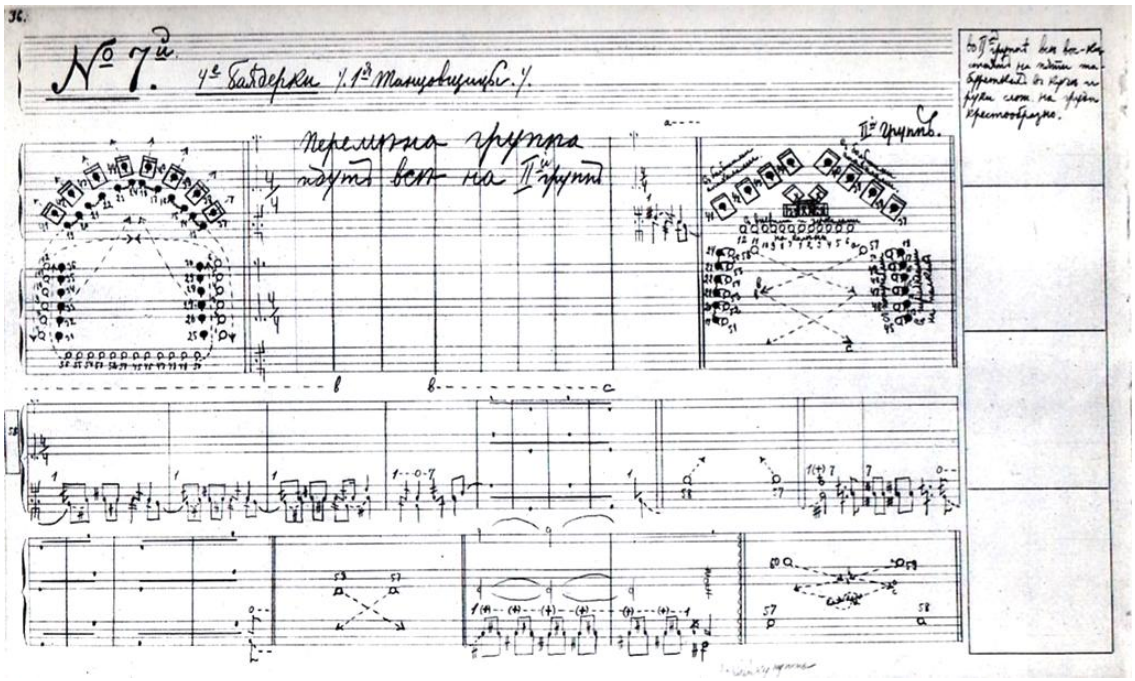


Figure 11. The recording of the ballet *La Bayadera*, made by Nikolai Sergeyev according to the system of Stepanov, circa 1899 (Gorskiy, 1899, p. 3-4)

The famous Russian dancer Vaslav Nijinsky modified Stepanov's system, improved it especially in the indication of directions and levels. It includes many changes and improvements to this system. In Harvard University Library‘s Theatre Collection the writing by Nikolai Sergeyev for Petipa's ballets is preserved. In 2015 the American Ballet Theatre staged *Sleeping beauty* on the base of those notation (fig. 13).

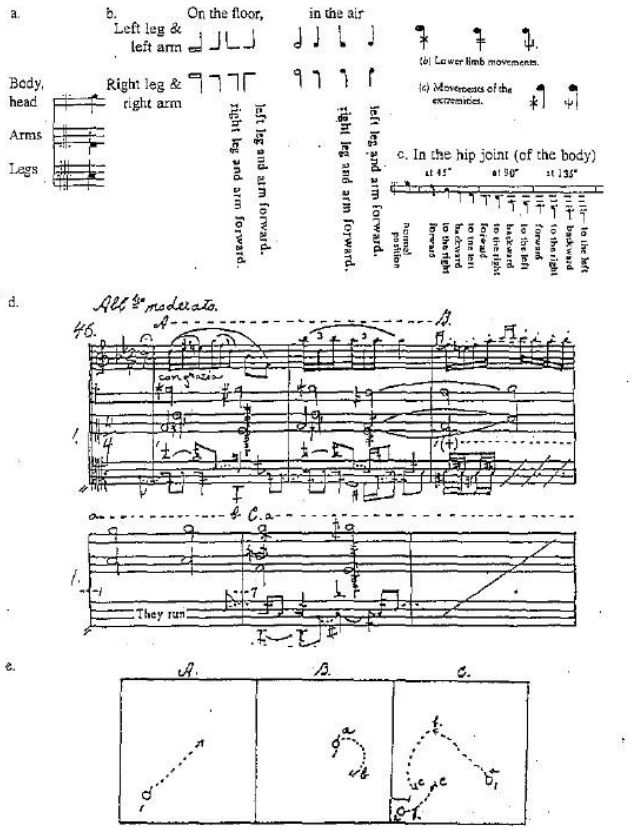


Figure 12. (a) staff for the placement of body parts; (b) different forms of the note signs; (c) notation of flexion and extension of hip joint; (d) an example of writing; (e) floor plans (Gorsky, 1978, p. 11,13,56; Hutchinson-Guest, 1984, p. 73).

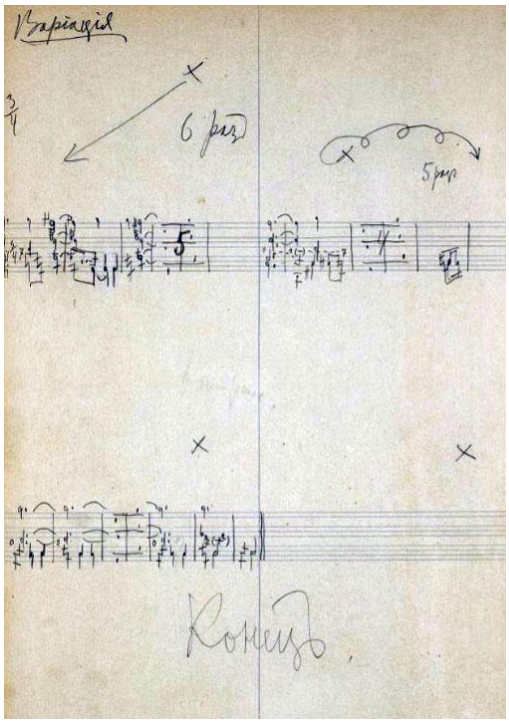


Figure 13. The final page of the ballet *Sleeping beauty* made by Nikolai Sergeyev according to the notations of Stepanov from the Harvard Theater Collection (Tchaikovsky, n.d., p. 187)

Iconic and Symbolic Signs in the Representation of Motion

The oldest dance tutorials show people in dance poses that are carefully and accurately traced (Thoinot Arbeau (1589/1967) *Orchesographie*, Fabritio Caroso's (1581/1983*) Il ballarino* and Cesare Negri's (1602) *Le Gratie d'Amore*). More modern choreographers can make their own sketches. For example, in addition to the floor plans and the mass scenes (fig. 10), Petipa made sketches of real dance movements and figure poses. sketches of profiles of one-, two- and three-figure compositions. For example, sketches of several dancers with tulle (fabric) for the ballet *Mlada*, sketches of duet movements-supports for the ballet *La Bayadère* and *Mlada*, grotesque drawings of buffoons and characteristic movements of the Slavic dance from the ballet *Mlada*, a sketch of the final scene (Odette and Prince), the image of a bird of prey for the ballet

Swan Lake (Portnova, 2016). The drawings are specific, each showing a particular movement of dynamics or stately poses.

But besides the notes of choreographers there are sketches by dancers. Pavel Gerdt was the permanent Prince of Desire from *Sleeping Beauty* from the premiere until 1903, and, as usual, sketched out the text of his part for memory (fig. 14).

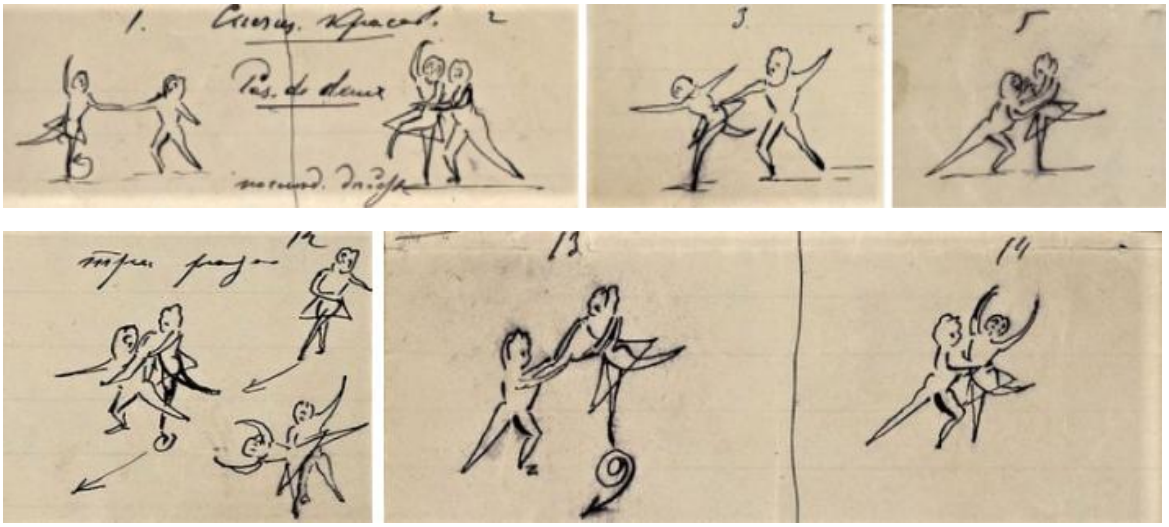


Figure 14. Pavel Gerdt's sequential sketches of the choreography for the pas de deux (pas de quatre) of *Sleeping Beauty*. Museum of the Bolshoi Theater. Circa 1890. (Ratmansky, 2018)

Aleksei Ratmansky (2018) compares Gerdt's sketch and Sergeev's notation to track changes in the performance of *Sleeping Beuty* between circe 1890 and 1903:

> The notation (this moment is not shown in the drawings) contains the words of Aurora, who says, addressing the audience: “I will dance with him,” to which Desire replies: “I love her and marry her.” This important detail, long abandoned, points to the active nature of the pas de deux, which, according to Petipa's idea, was a pas d'axion, and not the concert duet that it has become today. Interestingly, Aurora still does not dare to talk about feelings, while Desire openly declares her love and proudly declares that she will "marry her." According to the plot, these gestures are not required; rather, they are additional colors that Petipa uses to describe the characters. After the "facial expressions" Aurora runs up to Desira and "hugs" him (the notation and the drawing are the same here), standing in a low attitude.

The sketches of the ballet master Mikhail Fokin are drawn in more detail than Petopa's but less schematic than Gerdt's ones. In his recordings one can see how the figures acquire a more conventional character in places. The images of people are reduced to "matchstick" figures in a single line. But the character of sketches shows the

difference in the style of the ballets *Blue God* (fig. 15) and *Judith* (fig. 16). Even at the initial stage, these ballets are distinguished by a deep sense of the style of the choreographic text, by the originality of its perception.

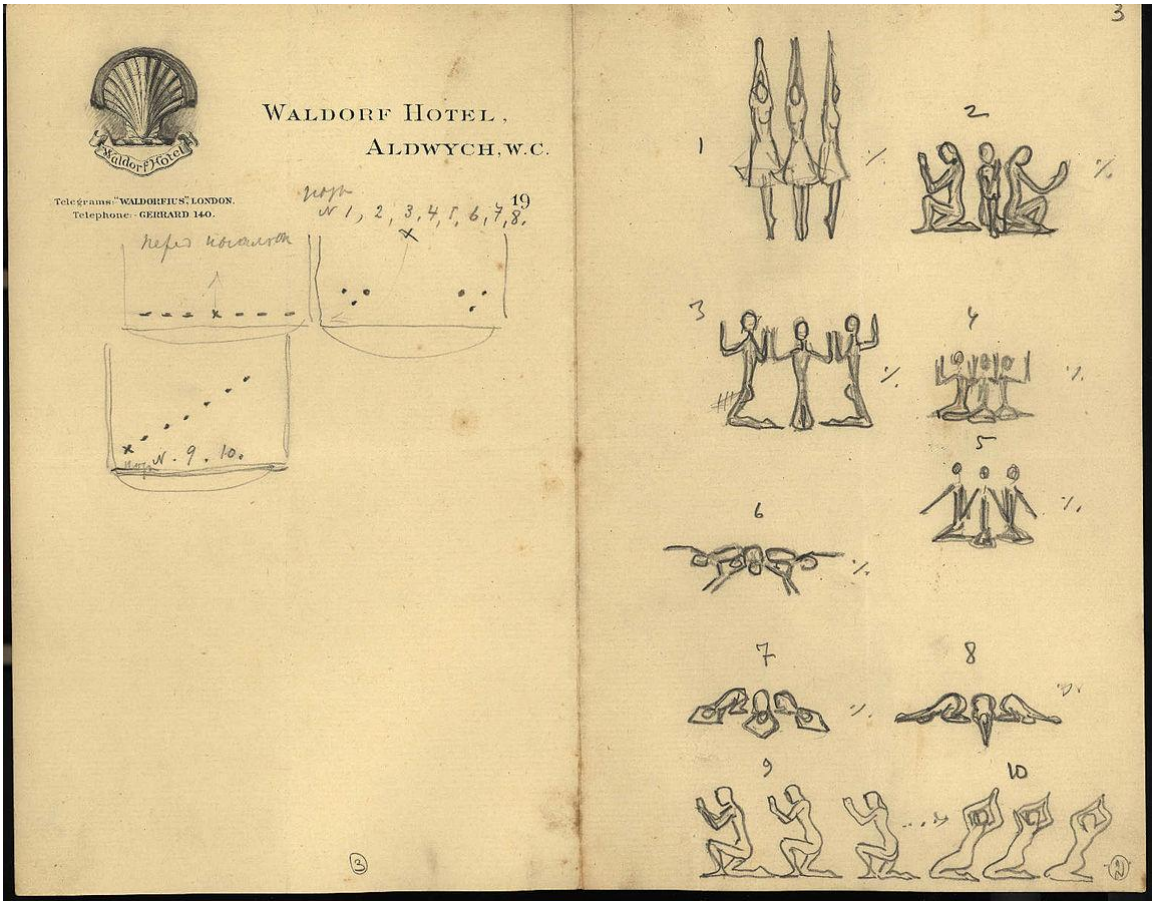


Figure 15. *The Blue God*, Fokine's ballet design (drawings, breakdown and character counts by apparition). 1912 (Fokin, 1912a)

However, the graphic representations of Fokine, Gerdt and Petipa are idiosyncratic and need to be simplified and streamlined in order to be transformed into a recording system. The use of more or less sketchy figures was typical of choreographers around the world (fig. 17, 18, 19).

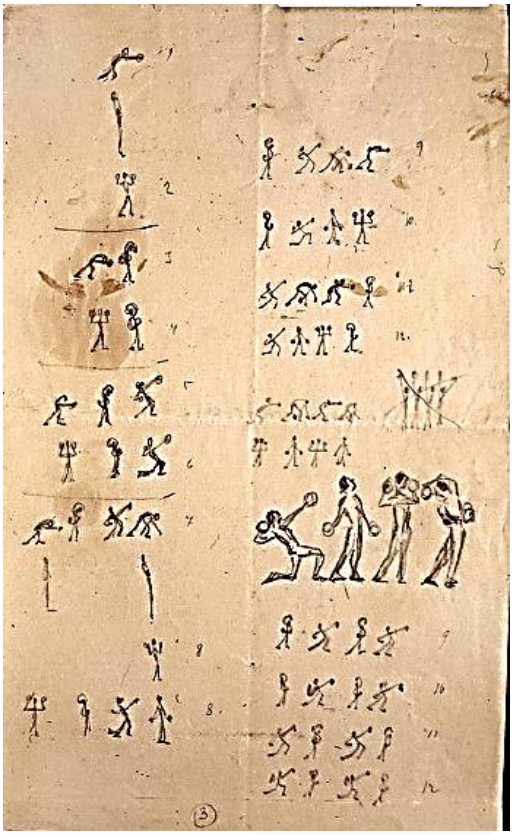


Figure 16. *Judith*, a choreographer's elaboration of the dances for Fokin's opera (schematic representation of the dances and individual groups, list of performers) (Fokin, 1912b)

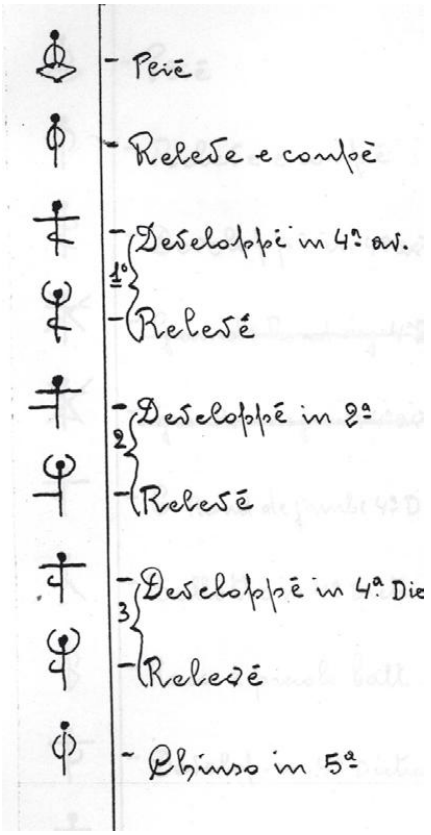


Figure 17. Grazioso Cecchetti, *Adagi*, "Trois relevés" (particolare), Museo Teatrale alla Scala, Milano (Pappacena, 2004, p. 55).

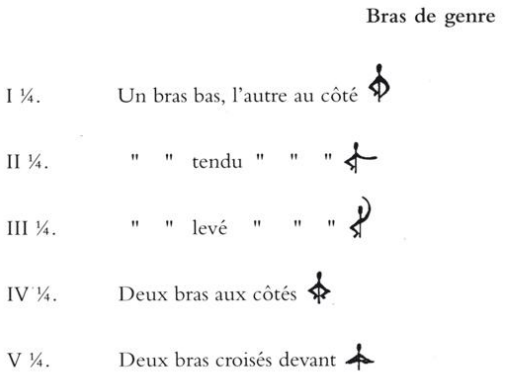


Figure 18. August Bournonville, *Nomenclature par ordre alphabétique*, 1861 (Pappacena, 2004, p. 55).

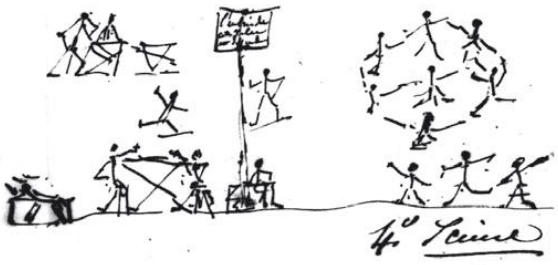


Figure 19. André Jean-Jacques Deshayes, schizzi coreografici, ca. 1820. Bibliothèque-Musée de l'Opéra, Parigi (Pappacena, 2004, p. 55).

Friedrich Albert Zorn crested a notation that continues to be comprehensible when looking at it, but that is also more codified, consisting of conventional human figures (fig. 20). The new notations make it possible to present a multitude of changing figures on one sheet, taking into account the anatomical details of a person.

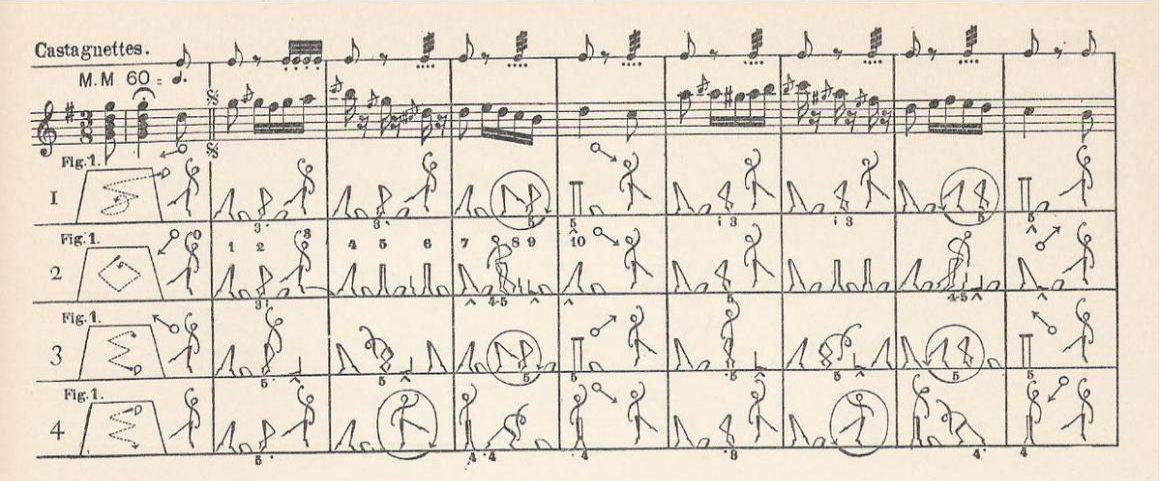


Figure 20. Dance notation *La Cachucha* by Friedrich Albert Zorn (1905)

Using five-lined staff, and the stick figure that was used by many authors, Olga Desmond (1919) presented the movement figure divided by staff in a very realistic way (fig. 21).

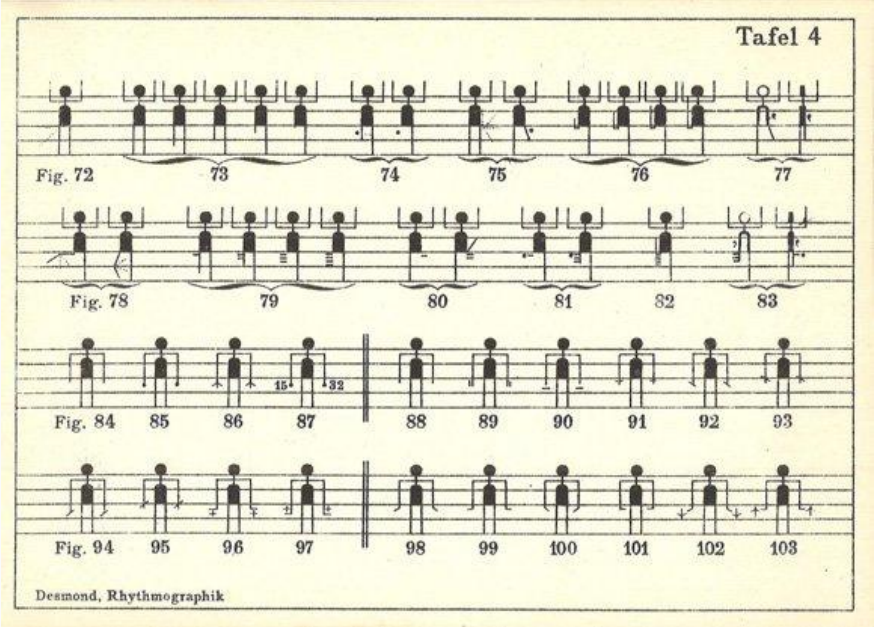


Figure 21. Notation by Olga Desmond (1919)

Valerie Sutton developed her system in a more symbolic direction (fig. 19, 20). She invented Sutton Movement Writing & Shorthand (SMW), a stick-figure movement notation system in use in the dance and sign language fields of the Royal Danish Ballet's system of training, the Bournonville Schools. Later it became clear that the universal motion scores can be used for mime, sign languages used by the deaf, martial arts, gymnastics, physical therapy, and ice skating (Otis, 1979). SMW places a stick figure drawing on a five-lined staff (fig. 22). The third dimension is notated below the stick figure with two rows of round symbols representing the overhead view of the person (Sutton, 1981).

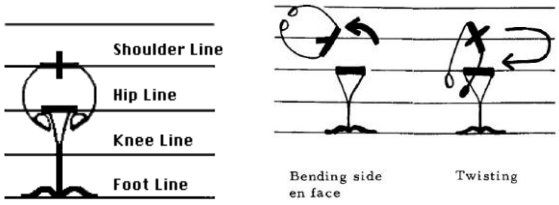


Figure 22. DanceWriting places a "stick figure drawing" on a five-lined staff (Sutton, n.d.; 1981).

When more than one dancer moves at a time in group dances, the notation for each person is placed on a separate staff line. The movements for each dancer are coordinated by counts, placed above the first staff with numbers (fig. 23).

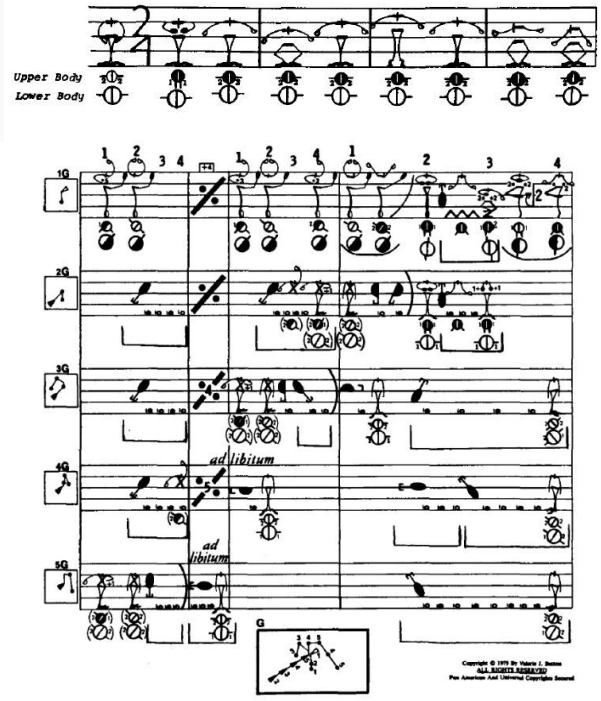


Figure 23. Group dance of five people *The Rose Adagio* (Sutton, 1981)

One of the problems solved in this way was the representation of motion in volume (Taplin, 2014). As Rudolf Benesh wrote in 1947

> Because of the enormous amount of information needed to record all details of movement of all parts of the body, in three dimensions of space and in time, it seemed that a great mass of symbols would be needed – and yet, to be workable, the resultant score had to be fast, economic, simple, universally applicable and as legible as the alphabet or music notation. Completeness and accuracy in fact seemed to make demands incompatible with speed, economy, simplicity, universality, and legibility. (Hall, 1967, p. 188)

The Benesh notation system reduces the human figure to its essentials by using distinctive signs to locate extremities, joints and segments on the stave (Mirzabekiantz, 2016). Figure 24 shows motion line system with which one can track the movement between positions. The dynamics are shown by a scale of six degrees of effort ranging from fff to ppp. In the gymnastic sequence in fig. 25 we see three runs, a step, and a strong pull-up jump (Hall, 1967).

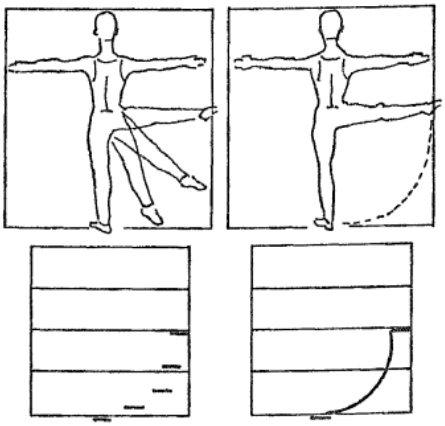


Figure 24. Benesh's motion line system (Hall, 1967)

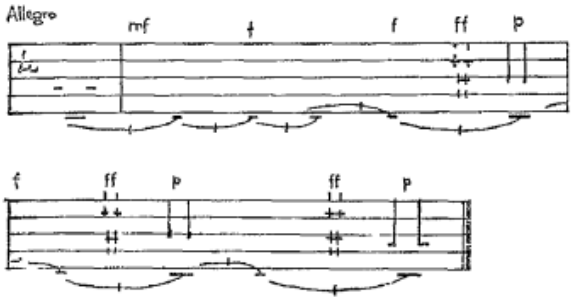


Figure 25. Three runs, a step, and a strong pull-up jump (Hall, 1967)

In order to plot a three-dimensional image on a two-dimensional page, the depth dimension is represented by three differently shaped signs that depict an extremity in front, level with, or behind the body. These three signs that represent the extremities (feet and hands)–a vertical stroke, a dash and a dot–are the foundation of the evolving Benesh Movement Notation alphabet (Mirzabekiantz, 2016, pp. 302, 303). In order to indicate action that takes place over more than one count, legato lines are written (Watts, 2015).

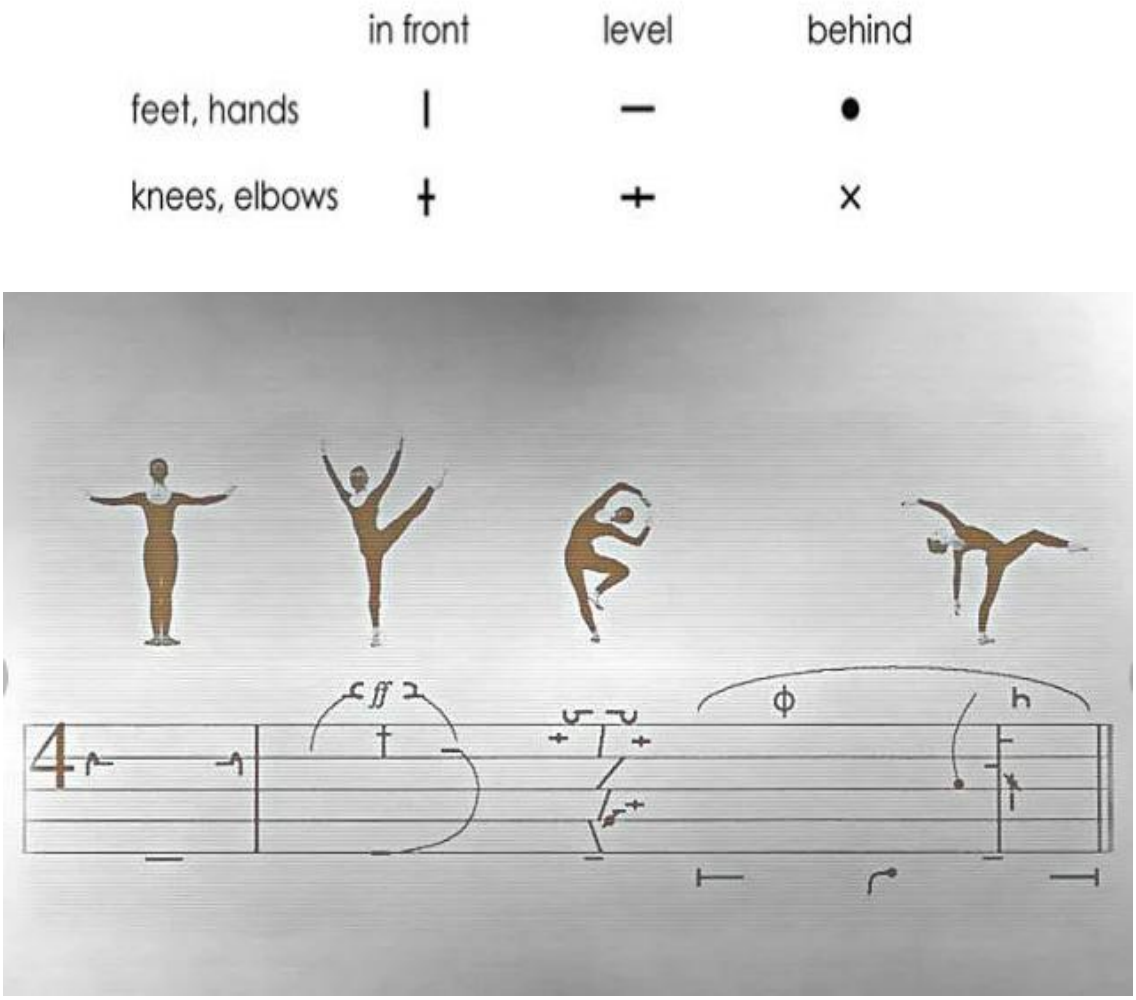


Figure 26. Benesh Movement Notation (Morilla, 2021)

Once the position of the limbs is recorded, the path of the extremities and the transitions from one key frame to another are shown (McGuinness-Scott, 1983). Points of contact of important moments are written on a stave of five lines dividing the human body in sections; these moments are tied by horizontal bows to show the succession of positions; below, the staff is devoted to space indications, and above, the staff time indications are written (fig. 26, 27) (Challet-Haas, 2016, p. 73). The scores record the totality of the actions of dancers performing different movements, they are recorded on the required number of connected staves, similarly to the score of a musical conductor. Each stave is labelled to show who is executing the movement recorded on it. Modifications of the direction sign are used to identify different individuals or groups of people. Women are normally represented by filled in identification heads and men by open ones (fig. 27). Simultaneous movements are recorded on vertically aligned frames.

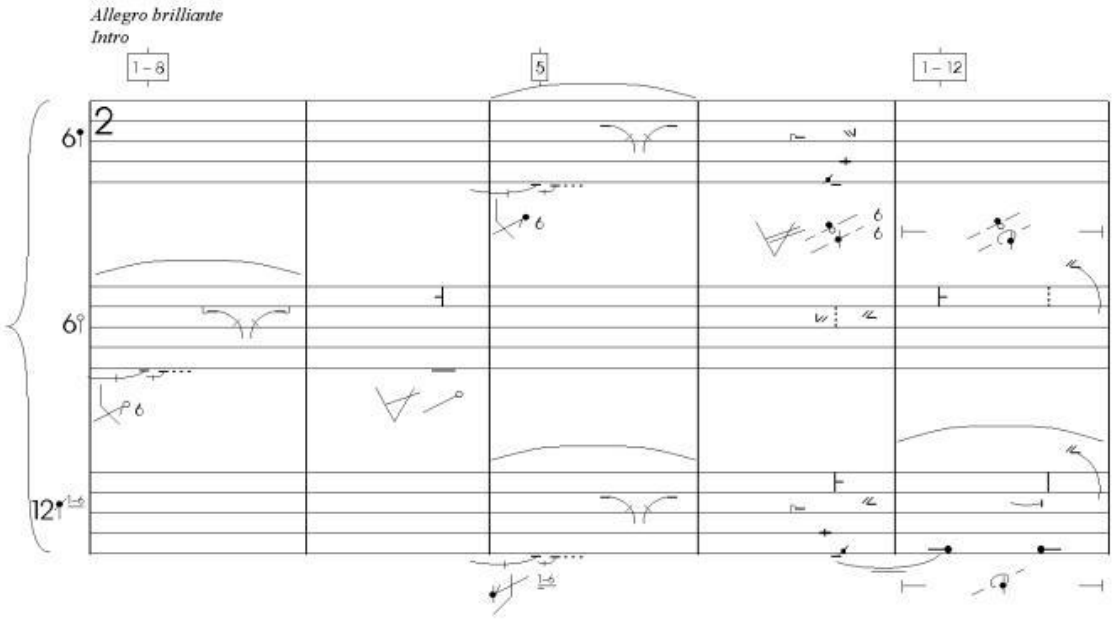


Figure 27. The Multi-person Benesh Movement Notation Score (McGuinness-Scott, 1983)

However, one of the most famous forms of recording movement by way of notation symbols (officially recognized by the Dance Congress in Essen in 1928) belongs to choreographer Rudolf Laban. By means of special notation symbols the duration (size of the notation), amplitude (by means of shading) and direction of movement (shape of the notation) were fixed.

The movements of the arms and legs in the Laban system look more "heavy" and redundant in comparison with the graceful lines of Benesh (fig. 28, 29).

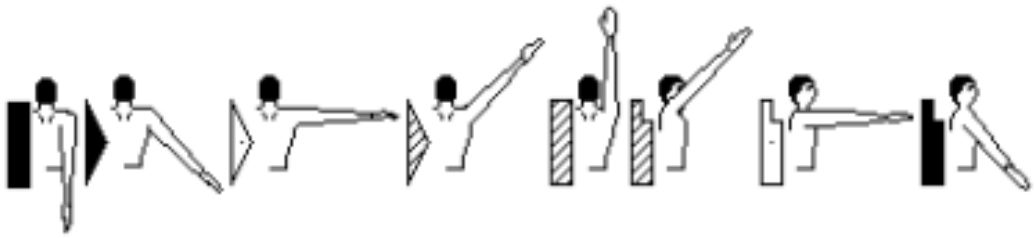


Figure 28. Hand movements (Brandl, 2020)

Figure 29. Leg movements (Brandl, 2020)

Laban experimented with various systems of dance script on the basis of his space theory until he achieved the system known as Kinetographie. He separately developed the idea of body movement and movement in space.

In Laban's (1926) German book *Choreographie*, a few times he uses a type of writing or signage which he calls "Diagonal Script." In the most explicit explanation of these signs, he arranges these into a table, each sign associated with one of the inclination numbers (fig. 30).

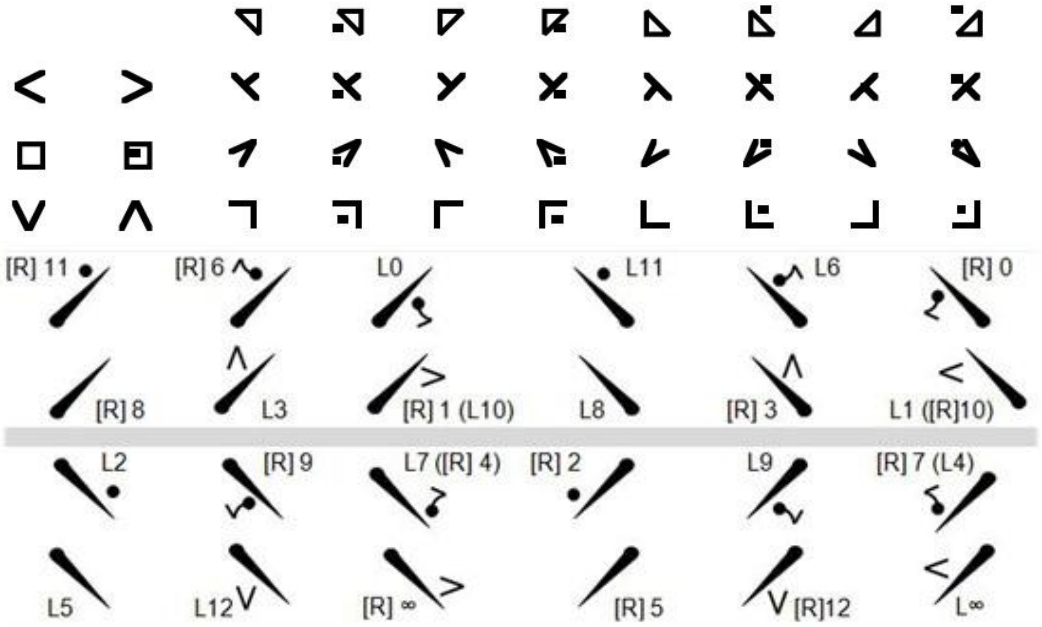


Figure 30. Early symbols used in Laban's (1926) *Choreographie*

Laban used Feuille's idea of using a vertical axis to represent the body in a standing position (fig. 31):

> The axis divides the body into two symmetrical parts (right and left). Parallel lines are drawn on both sides of the axis to identify the different parts of the body. Rectangle shape modifications indicate the direction of movement. The hue of the symbol indicates the level of movement. The length of the symbol indicates the duration of the movement (Barbacci, 2002).

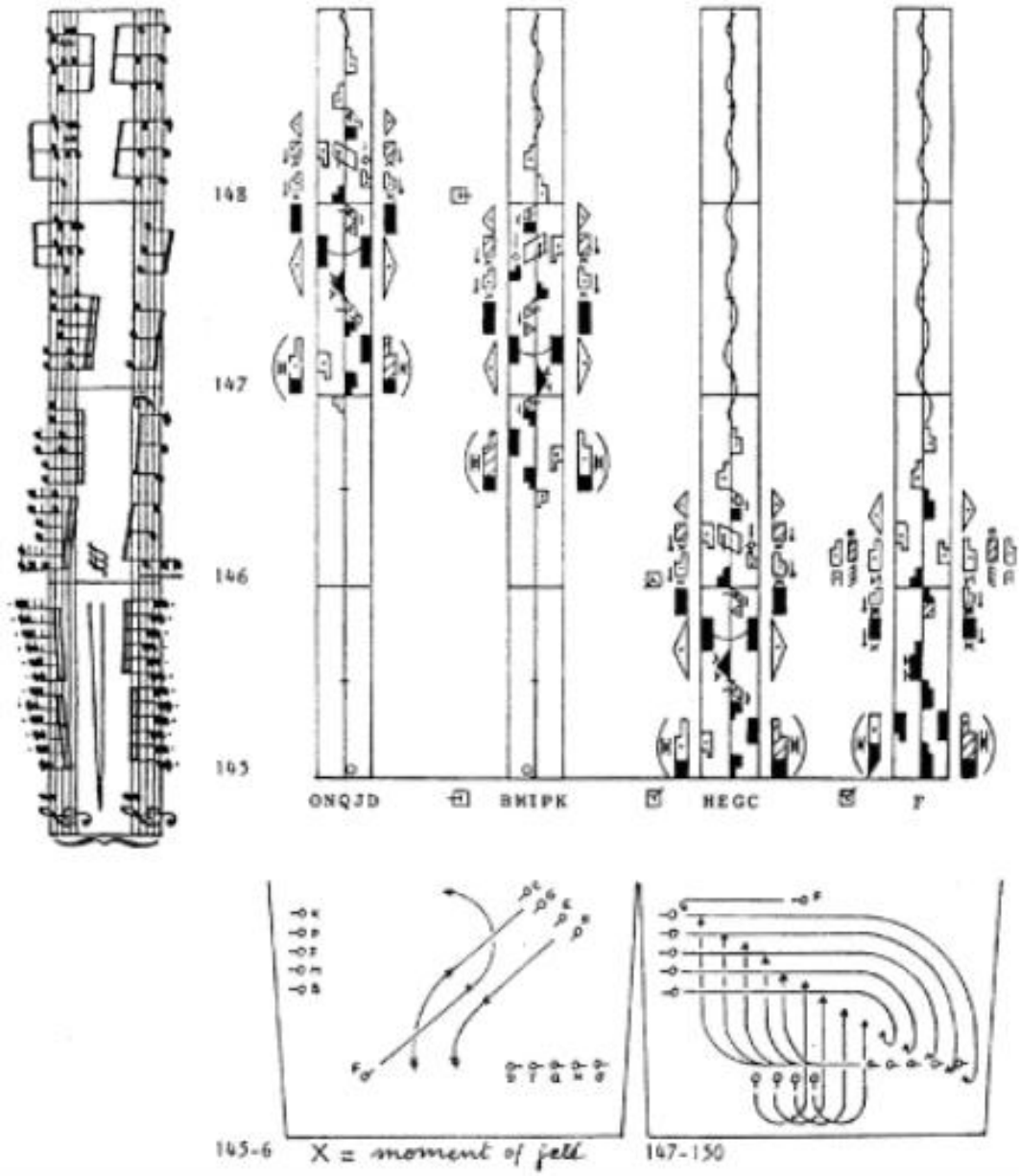


Figure 31. A page from Rudolf Laban's *Schrifttanz*, 1928. (Guest, 2006)

As a result, Laban developed a harmonious system which is the most famous today (fig. 32, 33, 34). The Kinetography system makes it possible to describe motion with a high degree of accuracy, considering weight, space, flow, time, and energy as fundamental parameters. At the same time, Laban sought not so much to create a *Tanzschrift* (dance-writing, a way to record) but a *Schrifttanz* (graphic–written–inscriptions to invent the dance) (Yuzurihara, 2014, p. 289).

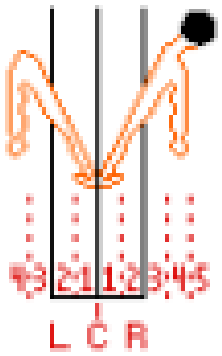


Figure 32. Division of note carrier into columns: L = left column, C = center column, R = right column; 1 = Supportcolumn, 2 = foot column, 3 = torso column, 4 = arm column, 5 = head column (Barbacci, 2002)

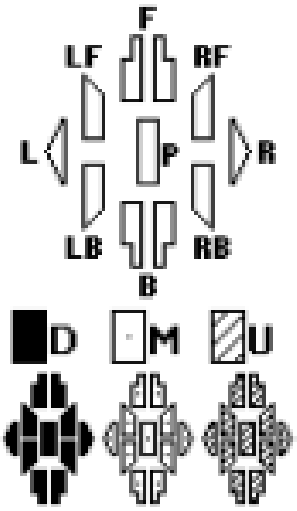


Figure 33. Directions and level of movement: F = forward, LF = left forward, RF = right forward, L = left, R = right, P = place, B = back, LB = left back, RB = right back, D = down, M = medium, U = up (Barbacci, 2002)

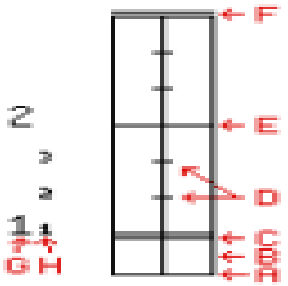


Figure 34. Time indication: A = Line at the beginning of the note, B = Starting position, C = Start of movement (double line), D = Time division indication, E = Start measure, F = End of movement (double line), G, H = Digits indicating time units (large numbers: measures; small numbers: units) (Barbacci, 2002)

The further development of notations was either based on the Laban system or sought to simplify it. Pierre Conté, combined musical notes with simple signs placed on an expanded music staff. Alwin Nikolais used a Laban-style vertical staff but in two parts, with torso and head indications placed separately on the right., created by the dancer and choreographer Eugene Loring with D.J. Canna. In *Kineseography* (1955) they proposed to four categories of movement: emotion, direction, degree, and special. It was used to record Loring's signature ballet, *Billy the Kid* (Guest, 2006).

It should be noted that certain types of dances used specific symbols and forms. For example, simple folk dances used an ancient and archetypal template with a basic three-measure pattern. Thus, in Macedonian *Pravo Oro* (fig. 35) the first two measures travel and the third measure mirrors the second. Another way to describe it is "step, step, step, do something, step, do something." Still another way is `three steps forward (pause), one step back (pause) .'

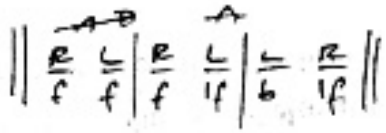


Figure 35. Notation of folk dance Macedonian *Pravo Oro* (Shannon, 1996)

Peculiarities of Recording a Theatrical Production

Theatrical productions usually have a literary original and are based in a text (just as dance performances are based on a musical score). Often, therefore, the director's work involves working with the text, where on the background of the existing verbal sequence appears a system of comments (often again, verbal), which give an idea of what is happening on stage and what the actors are doing, as in this text by Anton Chekhov with notes by Konstantin Stanislavsky:

> HELENA. Frankly, my thoughts were elsewhere. Forgive me! I want to submit you to a little examination, but I am embarrassed and don't know how to begin.
> ASTROFF. An examination? №80
> HELENA. №81 Yes, but quite an innocent one. Sit down. №82 [They sit down] It is about a certain young girl I know. Let us discuss it like honest people, like friends, and then forget №83 what has passed between us, shall we?
> ASTROFF. №84 Very well. №85
> HELENA. It is about my step-daughter, Sonia. №86 Do you like her? №87
> ASTROFF. №88 Yes, I respect her. №89
> HELENA. №90 Do you like her–as a woman? №91
> ASTROFF. [Slowly] No. №92
> HELENA. №93 One more word, and that will be the last. You have not noticed anything? №94
> ASTROFF. No, nothing.
> HELENA. [№95 Taking his hand] You do not love her. I see that in your eyes. №96 She is suffering. You must realise that, and not come here any more. №97
> ASTROFF. My sun has set, yes, and then I haven't the time. №98 [Shrugging his shoulders] Where shall I find time for such things? [№99 He is embarrassed.]»
> *№80 Astrov at the piano; looked around, surprised.*
> *№81 She is even more busy with the socket. Astrov folds cartograms.*
> *№82 Broke away from the socket, decided, points to a chair.*
> *№83 She has made up her mind, she speaks too briskly from nervousness. Astrov sat down in perplexity.*
> *№84 Astrov shrugged his shoulders.*
> *№85 Awkward pause. Elena was confused, lost her resolve, and busied herself with the folds of the wrapped cartogram.*

№86 Awkward pause. Elena leaned even closer to the cartogram. Then she abruptly raised her head and looked up at Astrov. With coquetry, biting his lip, wanting to disguise embarrassment with coquetry.
№87 Astrov looks straight into Elena's face, who realized that coquetry would not help here.
№88 Astrov – resolutely, firmly.
№89 The pause is awkward. Elena lowered her eyes, turned back to the map.
№90 Timidly. Where 0 is a pause. She crumples.
№91 Elena's timid but serious look. Pause. Astrov averted his eyes, hammered on the table, shook his head negatively.
№92 Pause. Elena leaned even more towards the map, Astrov thoughtfully plays with a hammer.
№93 Elena started up, dropped the phrase decisively, taking up the socket. Where f is a pause, it crumples. Elena stares at the socket.
№94 Pause. Astrov turns his eyes to Elena.
№95 Pause. Elena turns her eyes to him without taking her hands off the socket.
№96 Turns his eyes to the socket.
№97 Elena blurted out this phrase, then, as if having dropped a mountain from her shoulders, leaned back and wiped herself with a handkerchief in excitement. Astrov taps the hammer on the table. Then he mumbled, smiled sadly, laughed bitterly through clenched teeth, raised his head, hit the table several times decisively, sighed and nervously shoved the hammer into his pocket.
№98 He waved his head hopelessly, nervously rubbed his hands, or his hands on his knees, or drummed; got up.
№99 Astrov froze, busy with a candle or picking at a cartogram. Pause. Elena gets up quickly, sighs, wipes herself. (Rezhissorskiye ekzemplyary, 1994, p. 78-79)

Nevertheless, sometimes it becomes necessary for the director to visualize movements, which leads to drawings (fig. 36).

Figure 36. Sketch from *Uncle Vanya* (Rezhissorskiye ekzemplyary, 1994)

Even these examples show that, unlike the three pillars of ballet (the dancer's movements, movements on stage and the correspondence to the music), in theatrical

recordings it is necessary to record interaction with objects, features of speech and non-verbal communication of the emotional state. Although theater did not lose its connection with music, notes were recorded, and sometimes a musical stanza was used as the basis of the recording, but it could be replaced by a "chessboard" for example.

At the Moscow Art Theatre for about 10 years (1907-1917) a form of recording was practiced recording that was proposed by director Arbatov. In it a special place was given to the interaction with the things. According to this system, all objects on stage were marked with Arabic numerals, actors with Roman numerals, and the direction of their movement with arrows. This record was easy to understand, but included only movements and interactions with objects (fig. 37).

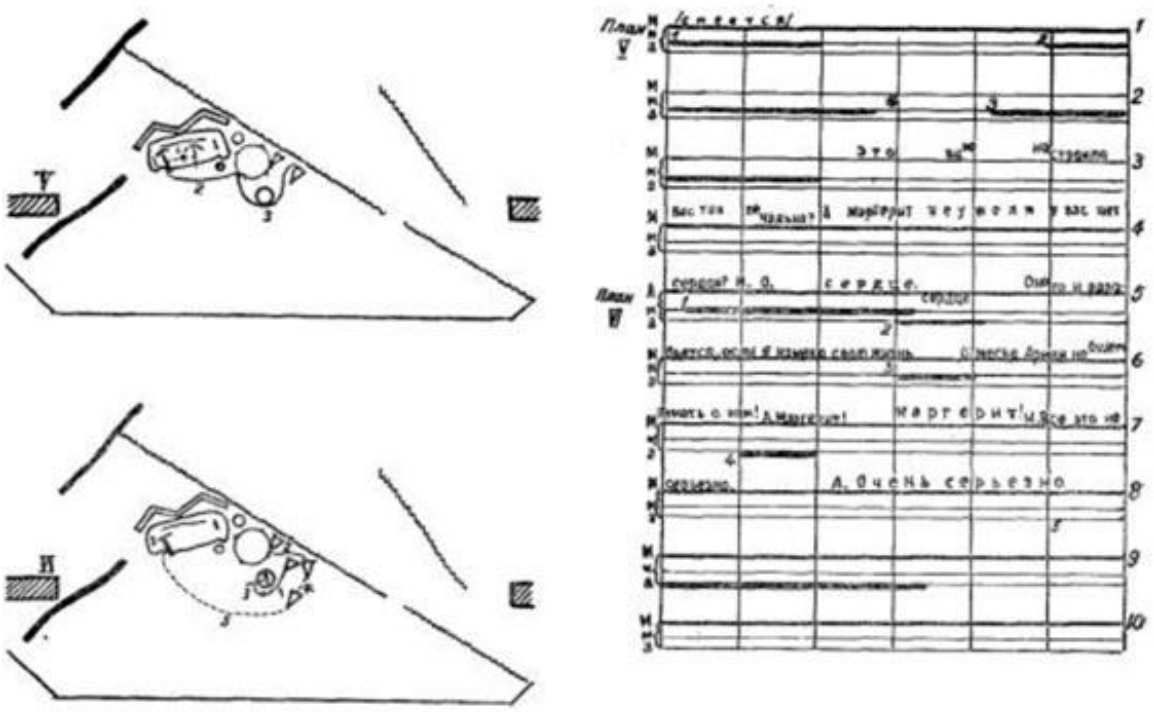


Figure 37. Fragment of the score for *The Lady of the Camellias* by Meyerhold. Excerpt from Act I, Episode 3 (*Meeting*) (Varpakhovsky, 1978).

A similar system was introduced by Ivanov, but unlike Abramov his notation had links to the music playing and the coordinates on the stage: Ivanov divides the stage into chess squares, taking into account the stage floor. The depth of each square is set at one meter; with the close squares corresponding to the bottom and the far ones to the top (Varpakhovsky, 1978). By way of paper, Ivanov was thus able to position the artists on stage more precisely, to set their speed and rhythm (fig. 38).

In the theater, they began to distinguish between "montage notation" and "chess notation." The editing recording is based on drawing the trajectory of the actor's movement around the stage on the floor plan. The notation of chess players indicates only the start and end points of the actor's movement (Gaiduk, 2016). A similar fixation was used in the theater of Bertolt Brecht, where photographs of each change in the position of the actors on the stage were attached to the text of the play.

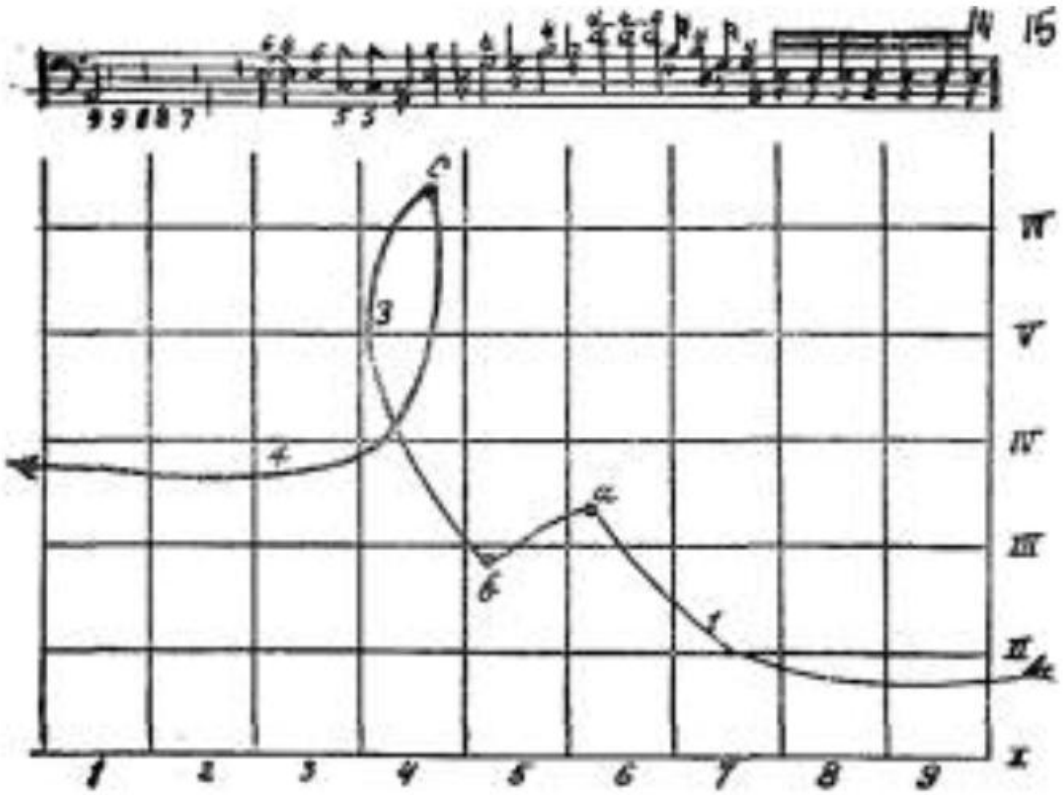


Figure 38. The actor's graph and the location of this movement in Ivanov's system (Varpakhovsky, 1978).

The stage area is divided into a number of squares by lines perpendicular to the lines of the floor. The movement of each actor is recorded on separate lines, so in scenes in which a large number of actors take part, the recording becomes similar to an orchestral score (fig. 39).

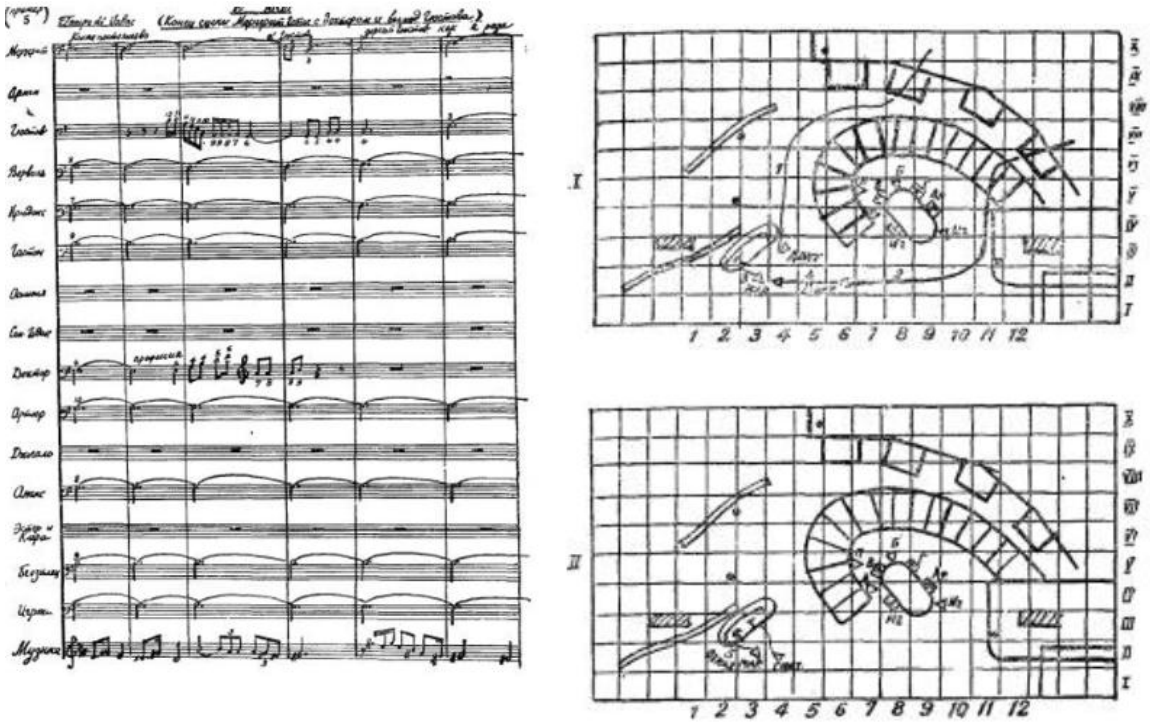
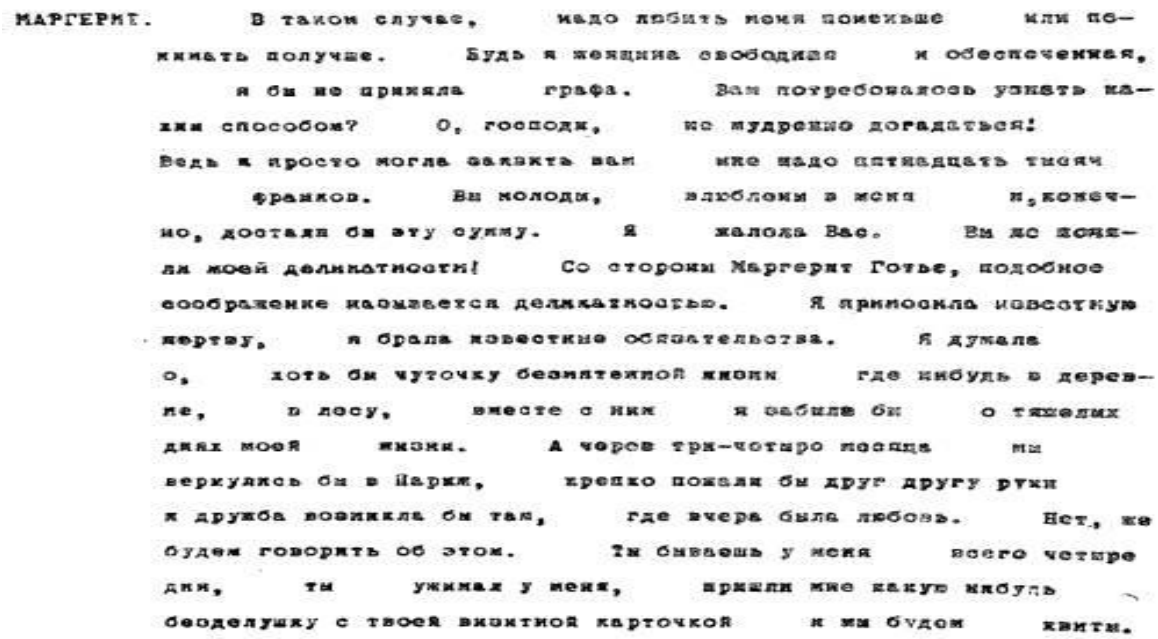


Figure 39. Marguerite Gautier's meeting with Gustave, recorded in Ivanov's system and on the plan. Graphic mise en scène (Varpakhovsky, 1978).

Recording Sound in the Theater

Unlike ballet, the sound notation of theatrical productions did not have its own iconic recording system. Recording the features of speech required its own recording system. A great difficulty was the indication of pitch (melody of speech), style (degree of loudness or accent), and speed (tempo and rhythm of speech).

The Theater of Vsevolod Meyerhold was a real experiment in which among other things, the sound part of the performance is fixed. In 1933 at the Theater named after him, Meyerhold organized a research laboratory. A group of researchers (Varpakhovsky, Sano, Held and other theater workers) studied Meyerhold's rehearsals and performances. Originally, to show a pause in the text, they just wrote "caesura" or "pause." But it was not clear how long the pause was, whether it lasted one second or five. Later, to show pauses researchers began to double the spaces, and to fix the pause they used a line, its length indicating the time interval. In the copy of the play *The Lady of the Camellias* all the stops were recorded in the speech made by the actors in the performance of April 10, 1934. The arrangement of caesuras indicates the extreme excitement and resentment of the heroine. In the ragged rhythm of speech, not only its internal state is felt, but also the form of expression (fig. 40). Then there were experiments regarding the objective and accurate fixation of the metro-rhythmic structure of the actors' speech.



МАРГЕРИТ. В таком случае, надо любить меня поменьше или по-
нимать получше. Будь я женщина свободная и обеспеченная,
я бы не приняла графа. Вам потребовалось узнать ка-
ким способом? О, господи, не трудно догадаться!
Ведь я просто могла сказать вам мне надо пятнадцать тысяч
франков. Вы молоды, влюблены в меня и, конеч-
но, достали бы эту сумму. Я жалела Вас. Вы не поня-
ли моей деликатности! Со стороны Маргерит Готье, подобное
соображение называется деликатностью. Я принесла известную
жертву, я брала известные обязательства. Я думала
о, хоть бы чуточку безмятежной жизни где нибудь в дерев-
не, в лесу, вместе с ним я забыла бы о тяжелых
днях моей жизни. А через три-четыре месяца мы
вернулись бы в Париж, крепко пожали бы друг другу руки
и дружба возникла бы там, где вчера была любовь. Нет, не
будем говорить об этом. Ты бываешь у меня всего четыре
дня, ты ужинал у меня, прислали мне какую нибудь
безделушку с твоей визитной карточкой и мы будем квиты.

Figure 40. Margarita is a monologue by Zinaida Reich from the second act of the play *The Lady with the Camellias* on April 10, 1934. censored copy of Neil (Varpakhovsky, 1978).

An analysis of the phonogram provided a completely objective picture of the rhythmic pattern of the Lomov-Ilyinsky's speech. After the study of the oscillogram – the curve produced by recording speech on tape – began, the Schorin system became very popular. It recorded sounds and then enlarged the phonogram forty times to make sure that each sound had its own imprint (fig. 41) (Smirnov, 2013). By changing the height of the envelope curve, it is possible to determine changes in the volume of the sound, and by the amplitude of the oscillations, changes in height.

The principle of Guido of Arezzo was used in The Meyerhold Theater to record changes in the melody of speech. In this case, only three gradations of pitch were recorded: above the line, on the line, and below the line (high, normal, low). Such three-degree gradation was also applied in relation to the volume of speech (quiet, normal, loud). Graphically it was expressed by changing fonts. In the score, as in any book, there are right and left pages. The right hand was reserved for the recording itself, and the left hand was used for additional reference material consisting of plans (Varpakhovsky, 1978).

Figure 41. The phoneme of the vowel sound A under stress (above). The phoneme of the stressed vowel O (below) (Smirnov, 2013)

Leonid Varpahovsky suggested that each character's speech be recorded on its own lines, indicating the speed and volume of the pronunciation. Varpahovsky's system, like most ballet movement recording systems, is based on a lined score. All characters in such a score have their own row of lines on which their text is marked. Varpakhovsky suggests distinguishing between three speeds of utterance and making appropriate designations: fast speech, normal speech, slow speech. Another important parameter when uttering was the volume of enunciation: quietly, mezzo forte, loudly. Next to the words on which the logical accent of the phrase is placed, there is either a dash mark (–) or an apostrophe mark ('). Varpahovsky takes the montage method of recording actors' movements as the basis for his graphic recording. Each actor is denoted by an isosceles triangle, within which the first letter of the character's name is written in order to distinguish the movement of different characters on stage. A character's movement is indicated by a line. If an actor makes a brief stop during a transition, it is indicated by a dot on the line. Slow actor transitions are drawn with a solid line, and fast ones are drawn with a dotted line (Gaiduk, 2017, p. 309).

German playwright, theater director and the first Master of the stagecraft workshop at the Bauhaus art school Lothar Schreyer created a unique graphic and highly artistic notation of a theatrical performance (fig. 42). It was called the Spielgang notation system from the German words *Spiel* (play) and *Gang* (gait or walking movement) (Buckley & Arbor, 2019). "This notation results in an independent dramatic work, fixed with symbols and words, which Schreyer calls *Spielgang*. A peculiarity of *Spielgang*, which can be conventionally translated as score, is the active integration into the language of the play of signs replacing individual indications in the author's remarks" (Schreyer, 1920). Lothar Schreyer used musical stanza, special symbols, and colors to express the actors' speech. (Schreyer, 2001). Schreyer uses three rows of lines for recording: the upper row records words and sounds, the middle row records the rhythm, pitch and volume of the actors' speech, and the lower row records the actors'

movements and gestures. Schreyer suggests using not only different symbols for pitch, loudness and tempo, but he also actively uses colors: for example, yellow color indicates high sounds, and blue color indicates low sounds (Gaiduk, 2016). Speech loudness was recorded in musical notation crescendo (<) dimiduendo (>).

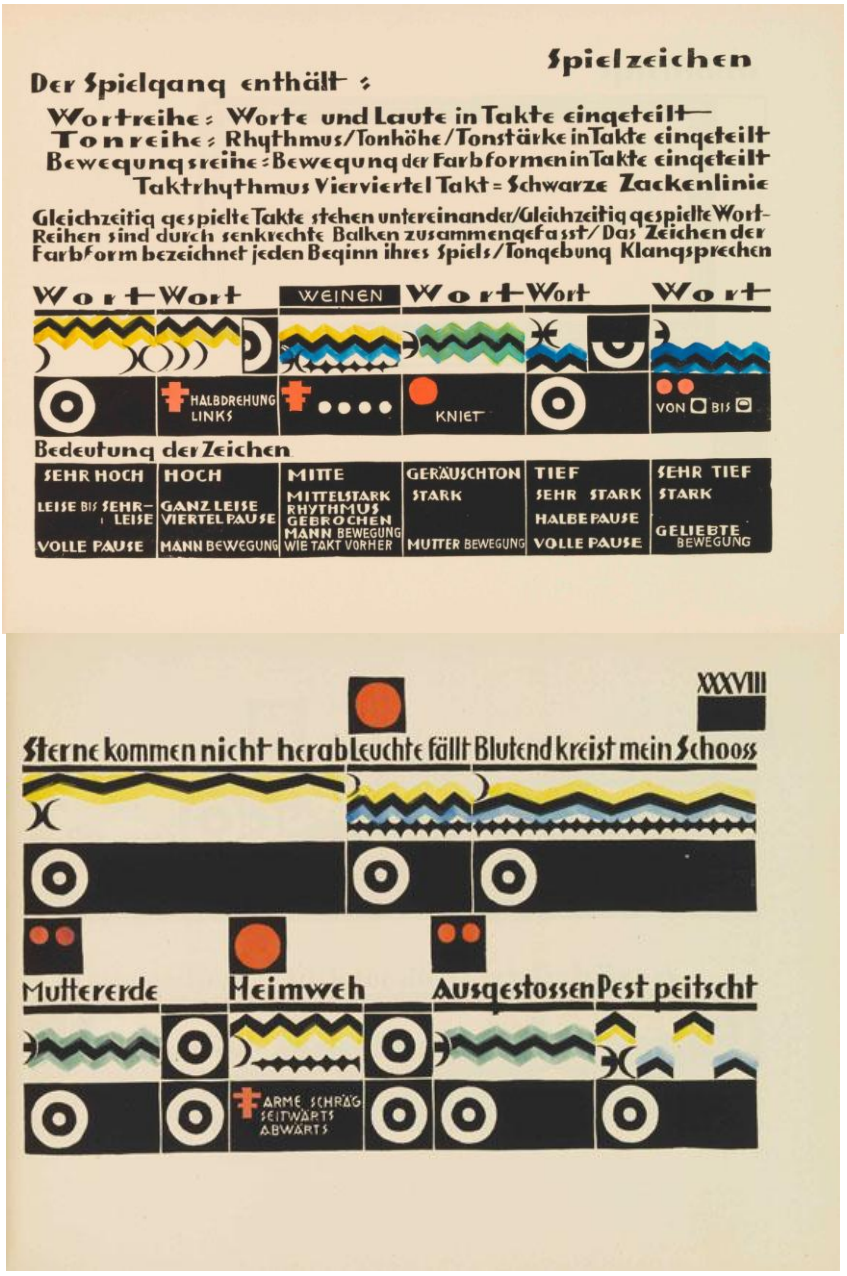


Figure 42. Lothar Schreyer *Kreuzigung Spielgang* Werk VII Hamburg, 1920 (Schreyer, 1920)

Synthetic Recording

The Studio of the Projection Theatre, created by Solomon Nikritin and Sergey Luchishkin in 1922, combined and dissected movements and speech. Projection Theater was adopted by the Central Institute of Labor (CIT) and became a kind of testing ground for the future. The Central Institute of Labor saw the studio as a testing ground for organizing the expression of labor methods on stage, towards creating an objective theater of contemporaneity and, ultimately, a theater of normalized labor which used different forms of notation (fig. 43).

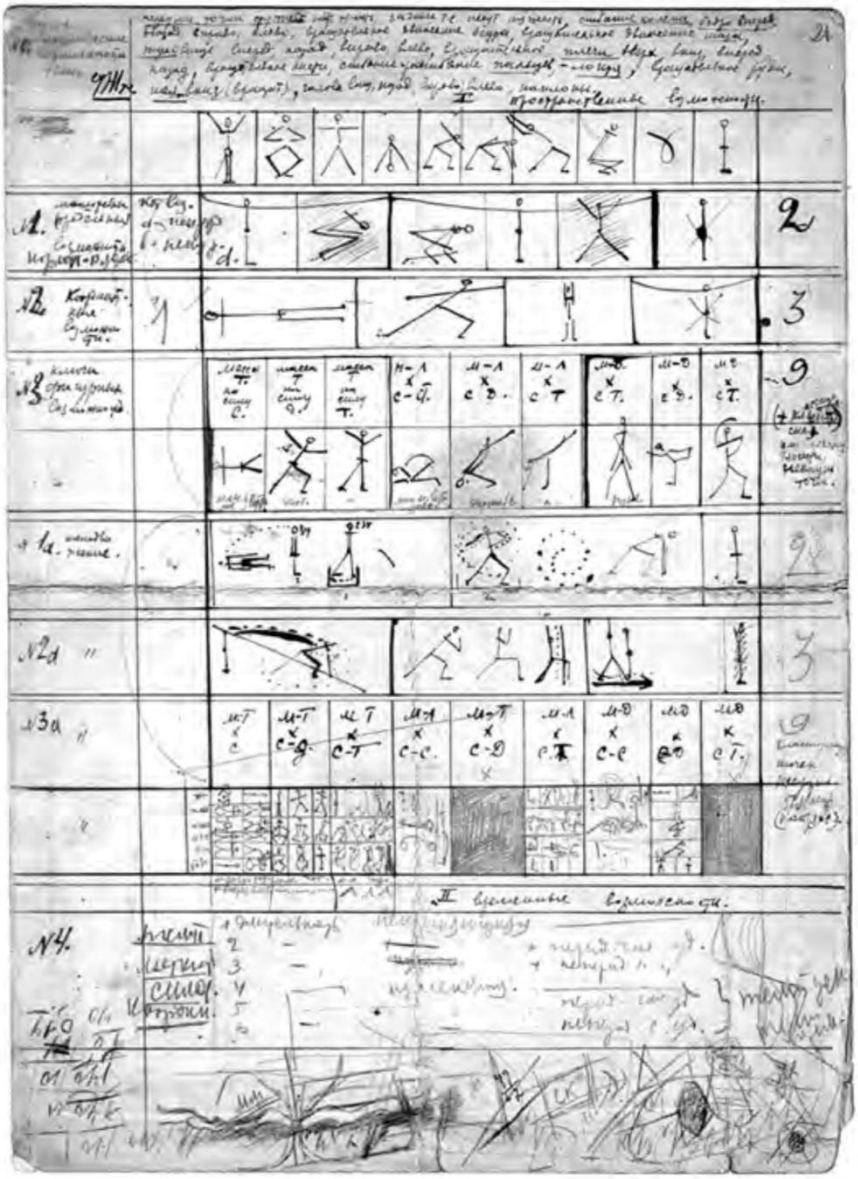


Figure 43. Nikritin's notes (Misler, 2004, p. 364)

Luchishkin wrote:

> We started to implement our experimental concepts by working up action scores by analogy with a piece of music, composing them out of different parts together with different rhythmo-dynamic characteristics. After that, we looked for the form of plastic expression in each part within the movement of the body, for the development of this movement, and for its nuances and transitions, including vocal resonance. All this was tinged by the emotional score which became the basis of the entire action. (Misler, 2004)

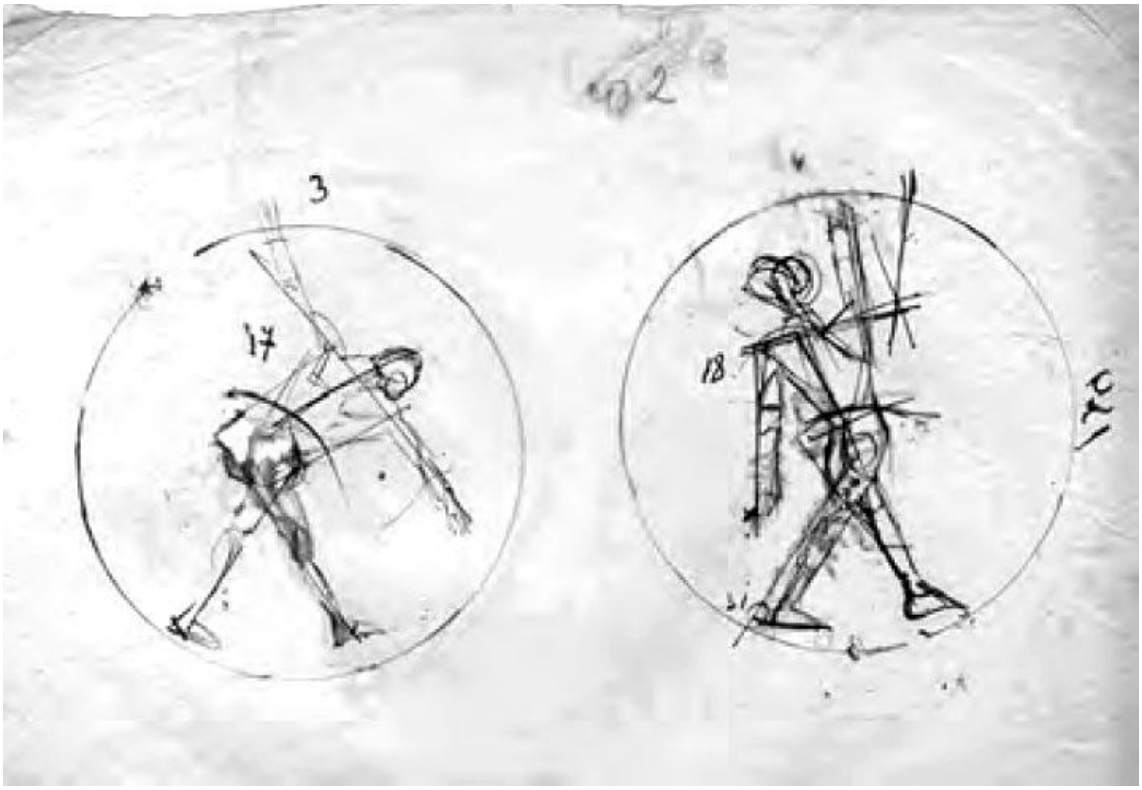


Figure 44. Solomon Nikritin, c. 1922. The notion of the *Octave* – the maximum area mechanically reachable by the dancer with their feet in a fixed position (Misler, 2004).

Nikritin developed, for example, biomechanical temperaments and scales of body movements. He tried to classify human movements, based on the principles of biomechanics and musical harmony. Nikritin introduced the concept of the octave as the basis of metrics. At fig. 44 he defines the maximum area to which a dancer can mechanically reach when his feet are in a fixed position (Smirnov, 2013).

Nikritin's notation was incomprehensible to the common viewer, but quite informative in terms of the staging of movements. He is not interested in the connection with space and time. But the voice plays an important role. In *Program on Sound* of the Projectionist Theater

Sound is a self-sufficient material. The process of sounding itself should be influential. Formation of the sound. Inventory and analysis of the sound material. The attitude to sound material in other theatrical schools. The way the sound material is considered at the Projectionist Theatre. (Smirnov, 2013)

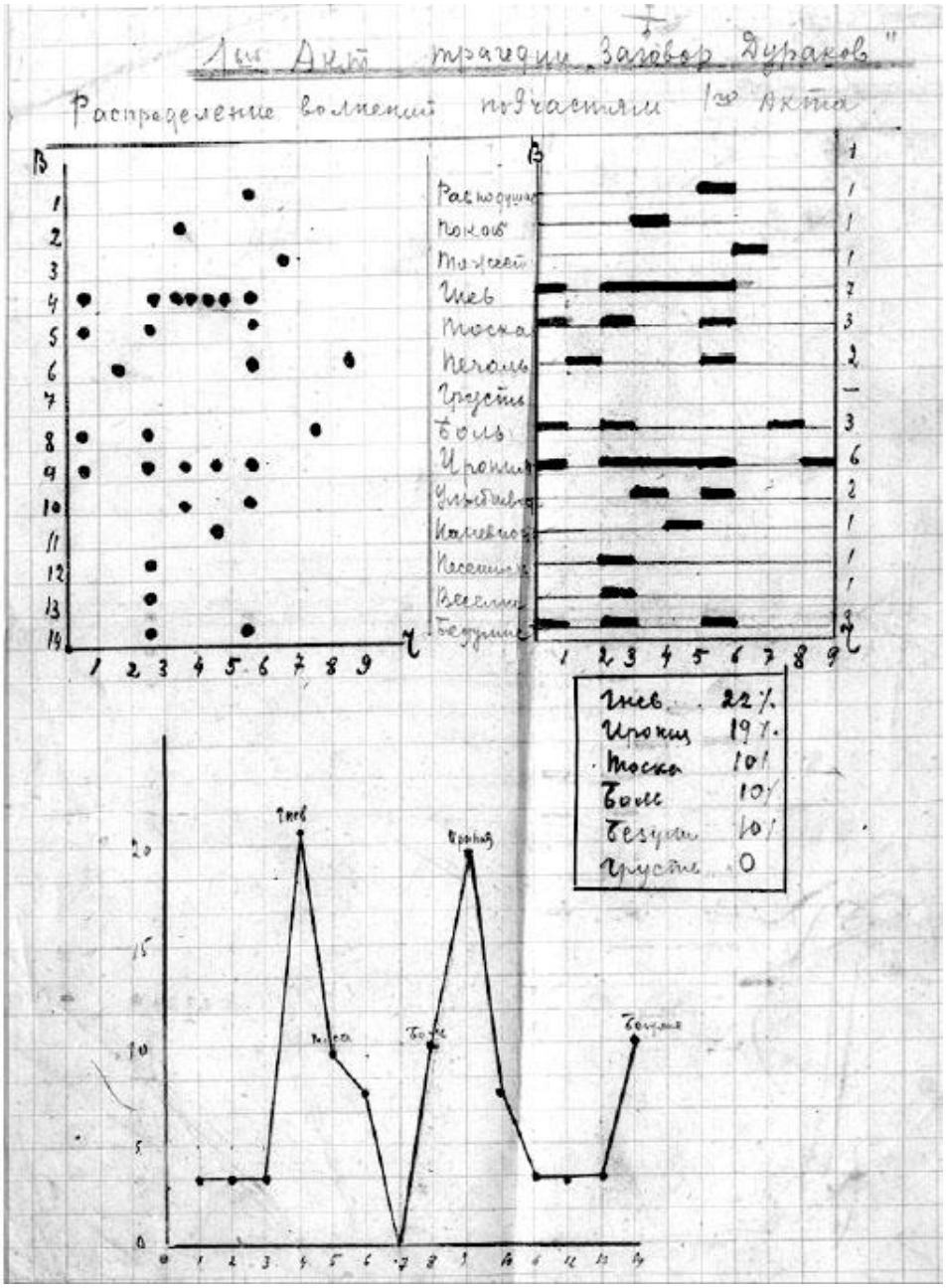


Figure 45. Solomon Nikritin. 1922. Statistical graphs of the distribution of the quantitative and qualitative presence of various emotional states in the first act of *Conspiracy of Fools* at the Projection Theatre (Pchelkina, 2013).

For the first act of *Conspiracy of Fools* which consists of nine parts, Nikritin made the first table in which he indicated the distribution in time of various emotions, such as anger, melancholy and sadness, reduced them to percentages and placed them on a graph (Fig. 45) (Misler, 2004, p. 364). Here we can see not only the essence of emotional experiences, but also their degree.

Sergei Luchishkin drew a Diagram of Emotional Excitement (fig. 46). The horizontal axis representing a timeline that is divided in sectors which indicate different situations: street, queue, madhouse, jubilee etc. The vertical axis indicates the state of emotional excitement of three actors. Actors were intended to express particular emotions by means of voice in combination with corresponding body movements (Pchelkina, 2013, p. 154)

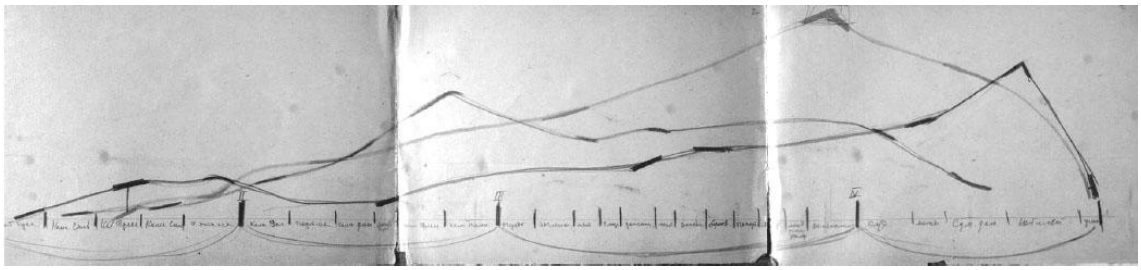


Figure 46. Diagram of the Emotional Excitement. 1920s (Pchelkina, 2013, p. 154).

Nikritin tried to assemble a unversal system for the whole of theatrical action. He writes that the keyboard of scenic movement consists of eight basic *Octaves of Phonetics of Movement*: 1) Octave of the first circle, abnormal stress from motionless point working body, 2) Octave of big horizontals, 3) Octave of verticals (obstacle), 4) Touch Octave, 5) Tragic Octave, 6) Comic Octave, 7) Satirical Octave, 8) The Octave of small contrasts. (Nikritin, 1922). Nikritin developed a system of human movements and gestures, color paletts, sounds (mainly related to the human voice), emotional states (based on the principles and terms of biomechanics), musical harmony and acoustics.

TECHNOLOGY RECORD

In the previous section, we talked about recording a performance primarily by the person who is producing it, who thinks through and records its plan. However, in the twentieth century there was a great interest in the fixation of events – an automatic, technical recording.

In 1921 the State Academy of Arts of Russia established the Laboratory of Dance Composition (since 1923 the Choreographic Section) where photo and video fixation of experiments in the field of body movements was carried out. Experiments on the fixation of movements were also carried out at the Institute of Labor under the direction of Nikolai Bernstein.

Vsevolod Meyerhold used in his productions the original graphical method of fixation on the basis of the chodometer of Varpahosky and Siano, which worked synchronously with the sound recording equipment. The main part of the chodometer was a coupling through which the tape moved from one reel to another. At the top of the sleeve were eight scribes – ink pens – each lowered onto the moving tape by the action of a magnet. Each scribe was controlled outside the device by pressing a special button, and there was a separate button for each scribe. At the moment the recording began, a button was pushed that actuated the mechanism of the electric clock. The mechanism would immediately time the start point on the tape and then every six seconds until the end of the recording. Each member of GosTIM's NIL was assigned to record the mise-en-scene of only one actor. At the moment the actor's movement began on stage, the button corresponding to the actor was pressed, and this button was released at the moment the actor's movement ended. Thus, the paper tape recorded, first, the fact of the actor's movement, second, the time of the beginning and the end of the movement, as the chodomer was equipped with a special clock, and, third, the duration of the movement itself (Haiduk, 2017, p. 309; Varpakhovsky, 1935).

The possibility of videotaping removed many of the issues associated with the ability to record what was happening on stage. It did not solve the problem of recording the performance, but the question has lost its relevance. Valerie Sutton notes,

> For all the machinery that has been developed in this century, no machine can replace the important ability of being able to write a language. The classic example of this is in music, where, though the tape recorder can record symphonies, orchestras of musicians still learn the music from the printed page. (Sutton, 1981)

Sutton here describes the asymmetry of the tape recording as a mere recording device and the written notation which is simultaneously an inscription and a score that instructs the repetition of the performance. It is therefore, that notations as scores play such an important role in philosopher Nelson Goodman‘s (1976) 20th century reflections on *Languages of Art*.

At the same time the attitude to the new technology was different. While Meyerhold hailed the arrival of film and saw in early cinema's techniques, others like Craig, Artaud, and Schreyer recoiled from the new medium, which seemed fully capable of swallowing drama as a whole, stepping into what is specific to stage performance in the era of the "photoplay" (Buckley, 2014). In any case, a two-dimensional image shot from a certain point is not enough for a detailed analysis of the production and it can function as a self-sufficient final product which can be replayed but does not need to be re-eneacted.

Interestingly, with the development of digital technology and robotics, movement notation is becoming relevant again. Once again there is a need to break down the movements into components and compose them into whole compositions, whether for

digital training of humans or non-human entities. The 'Web3D dance composer' for ballet e-learning is based on the separation of elementary petit allegro ballet steps that are digitally acquired through 3D motion capture systems, and categorised into families and sub-families. (Umino et al., 2009). The use of notation in motion capture can significantly reduce the cost of technology that is usually only available to major film and game companies (Calvert, 2016).

In addition, the combination of notation and modern technology allows the creation of new art objects (Papadopoulou & Schulte, 2016).

New techniques and notation are also being created for the purposes of digital notation. As early as the late 1960s, Noa Eshkol and her team were invited to the Biological Computer Laboratory at the University of Illinois to create computerized visualizations of the movement paths described by Eshkol-Wachman Movement Notation (EWMN).

The Eshkol-Wachman movement notation is a system to record movement on paper or a computer screen (fig. 47, 48). It was developed by choreographer Noa Eshkol and architect Abraham Wachman. It was originally developed for dance to enable choreographers to write a dance down on paper that dancers could later reconstruct in its entirety, much as composers write a musical score that musicians can later play. Figure 47 shows an example “Stick figure” and “Law of ‘light’ and ‘heavy’ limbs”, basic concepts and rules EWMN.

Figure 47. ‘Stick figure’ (Eshkol & Wachmann, 1958, p. 27)

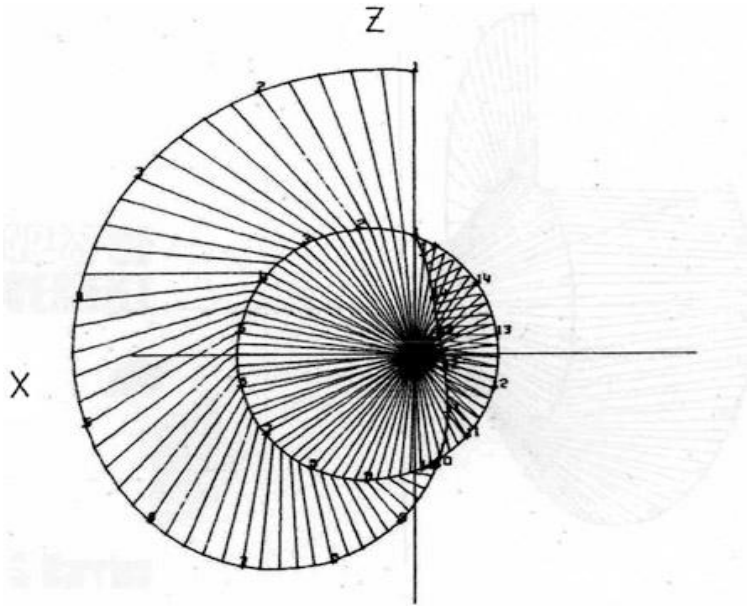


Figure 48. Eshkol's Space-chords of simultaneously moving abstract limbs (Drewes, 2016, p. 93)

The example of an EWMN score in fig. 49 is read from left to right. Horizontal spaces represent the different limbs and their parts which are nominated at the beginning of each space. Positions and movements are analysed along a spherical system of reference, the moving limb being the axis. Numbers and small arrows are used to indicate the coordinates of each position or movement within the circular form drawn by the moving part of the body. Other signs are used for indicating contacts, relationships, flexions/extensions etc. Vertical lines delineate time units and thick lines represent bar lines (Challet-Haas, 2016).

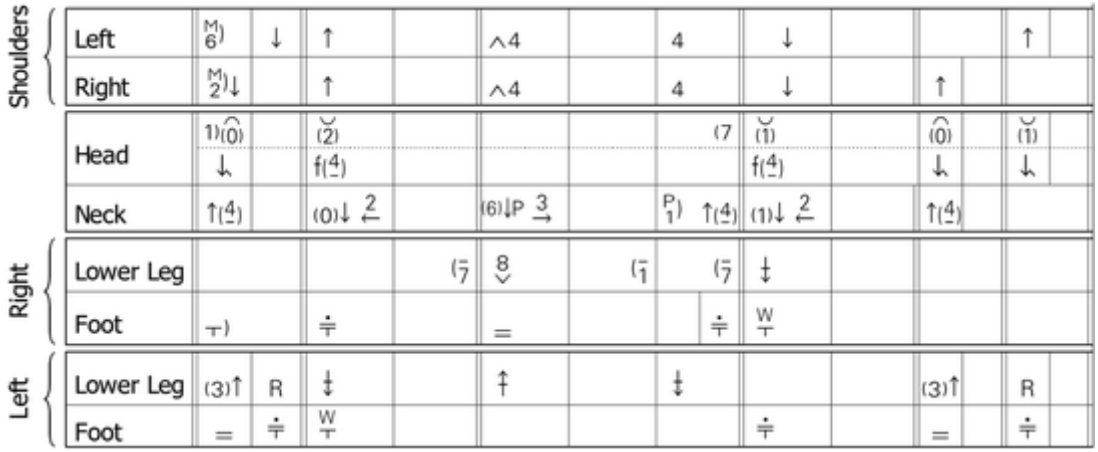


Figure 49. Example of an EWMN score Movement language for 3D visualization and composition of Dance An extract of *Dove* from the composition *Birds* by Tirza Sapir. (Drewes, 2016, p. 98)

In the 1970s, numerous attempts were made to digitally notate dance (Badler & Smoliar, 1979; Smoliar & L. Weber, 1977). Computer programs allow you to speed up the process of transcribing movements and offer neat scores (for example, LINTEL LabanDancer, Labanwriter by Dance Department of Ohio State University, Emote, Nuntius, MacBenesh, Dance-Forms, GenLaban). There are the Eliane Mirzabekiantz Benesh Movement Notation for Humanoid Robots and Henner Drewes: MovEngine-Developping a Movement language for 3D visualization and composition of Dance.

Notations are a convenient basis for representing and analyzing expressive movement, for artificial agents, such as animations, kinetic sculptures and environments, and robots. In particular for characterizing and generating expressive movement (Burton et al., 2016). Combining a dance notation system with a robot programming system allows one to compare and enlighten differences between robot and human movements (Salaris et al., 2017).

CONCLUSION

The possibility of capturing complex representations on paper seems a daunting task because of the sheer number of variables that change their values in space and time.

It is no exaggeration to say that it is a record of a certain quintessence of life in its three-dimensional and temporal dimension. It is not without reason that ancient Chinese notations diagrammatically represented the universe (Strauss et al., 1977, p. 7). Not being able to record everything, the authors of notation fictionalized what they considered to be most important. Most often this was necessary to transmit knowledge to others.

Forms of recording productions are specific languages that appeared, spread in interested circles, faded away, to be revived again in new variants. In the field of dance notation, we can say that there are several of the best known and most used "languages," which does not deny the possibility of using different systems by different authors. At the same time, the type of notation is related to the peculiarities of the dance and cannot always claim to be universal. There is no recognized system of signs in the theatrical environment at all.

Rich variability, the use of letters, numbers, notes, arrows, specific iconic, symbolic signs associated with body movements, various ways of indicating spatial and temporal location, notation of voice features, and the interaction with things makes the study of performance records a rich research material not only from the perspective of theater history, but also from the perspective of semiotic systems. Unlike letters and notes, motion recording conveys what can be visually clear, so the desire to use iconic signs that can be easily read by anyone without special knowledge is understandable. However, a developed symbol system can convey more information (including, for example, movement time, which cannot be recorded iconically), but requires special training in the meaning of symbols. As Murphy (2021) notes, this form of notation is complex and can only be used and understood by small numbers of people. The system of notation of voice can also be intuitively clear or with specific notations. Thus, depending on the code, the semiotic systems used can be either publicly available or privileged. For example, Schreyer sought to keep his handcrafted book-cum-performance score *Kreuzigung* (crucifixion) restricted to the “spiritually select” (Buckley & Arbor, 2019).

The great advantage of notation over videotaping is the intellectual work behind it, the analysis and synthesis of the elements that make up the essence of what is happening on stage. A person does not need to look through a video file, which can be quite large, to understand the essence of what is happening. This is why the notation is in demand today for motion analysis and to generate 3D character animation, motion capture, digital learning of humans or non-human entities. This is why it is nowadays used in many areas of both art and digital technology.

REFERENCES

Arbeau, T. (1967). *Orchesographie*. Dover Publications. (Original work published in 1589)

Badler, N. I., & Smoliar, S. W. (1979). Digital representations of human movement. *Computer Survey*, *11*(1).

Barbacci, S. (2002). Labanotation: a Universal Movement Notation Language. https://jcom.sissa.it/sites/default/files/documents/jcom0101%282002%29A01.pdf

Bianchini, S., Levillain, F., Menicacci, A., Quinz, E., & Zibetti, E. (2016). Towards Behavioral Objects: A Twofold Approach for a System of Notation to Design and Implement Behaviors in Non-anthropomorphic Robotic Artifacts. In J.-P. Laumond & N. Abe (Eds.), *Dance Notations and Robot Motion, Springer Tracts in Advanced Robotics 111* (pp. 1–24). Springer. https://doi.org/10.1007/978-3-319-25739-6_1

Brandl, F. L. (2020). On a Curious Chance Resemblance: Rudolf von Laban's Kinetography and the Geometric Abstractions of Sophie Taeuber-Arp. *Arts*, *9*(1), 15. https://doi.org/10.3390/arts9010015

Buckley, J. (2014). The Bühnenkunstwerk and the Book: Lothar Schreyer's Theater Notation. *Modernism/Modernity*, *21*(2), 407–428. https://doi.org/10.1353/mod.2014.0035

Buckley, J., & Arbor, A. (2019). *Beyond Text: Theater and Performance in Print After 1900*. University of Michigan Press.

Burton, S. J., Samadani, A.-A., Gorbet, R., & Kulić, D. (2016). Laban Movement Analysis and Affective Movement Generation for Robots and Other Near-Living Creatures. In J.-P. Laumond & N. Abe (Eds.), *Dance Notations and Robot Motion, Springer Tracts in Advanced Robotics 111* (pp. 25–48). Springer. https://doi.org/10.1007/978-3-319-25739-6_2

Calvert, T. (2016). Approaches to the Representation of Human Movement: Notation, Animation and Motion Capture. In J.-P. Laumond & N. Abe (Eds.), *Dance Notations and Robot Motion, Springer Tracts in Advanced Robotics 111* (pp. 49–68). Springer. https://doi.org/10.1007/978-3-319-25739-6_4

Caroso, F. (1983). *Il ballarino di M. Fabritio Caroso da Sermoneta, diuiso in due trattati* [The ballarino by M. Fabritio Caroso da Sermoneta, divided into two treatises]. University Microfilms International. (Original work published in 1581)

Challet-Haas, J. (2016). The Problem of Recording Human Motion. In *Dance Notations and Robot Motion. Springer Tracts in Advanced Robotics, vol 111*. (pp. 69–89). Springer. https://doi.org/10.1007/978-3-319-25739-6_4

Desmond, O. (1919). *Rhythmographik (Tanznotenschrift) als Grundlage zum Selbststudium des Tanzes* [Rhythm graphics (dance notation) as a basis for self-study of dance]. Breitkopf & Härtel.

Drewes, H. (2016). MovEngine–Developing a Movement Language for 3D Visualization and Composition of Dance. In *Dance Notations and Robot Motion, Springer Tracts in Advanced Robotics 111* (pp. 91–116). Springer. https://doi.org/10.1007/978-3-319-25739-6_5

Eshkol, N., & Wachmann, A. (1958). *Movement notation*. Weidenfeld and Nicholson,

Esses, M. (1992). *Dance and Instrumental Diferencias in Spain During the 17th and Early 18th Centuries: History and background, music and dance*. Pendragon Press.

Farnell, B. M. (1996). Movement Notation Systems. In P. T. Daniels & W. Bright (Eds.), *The World's Writing Systems* (pp. 855–879). Oxford University Press.

Feuillet, R.-A. (2018). *Orchesography. Or, the art of Dancing, by Characters and Demonstrative Figures. Wherein the Whole art is Explain'd; an Exact and Just*

Translation French of Monsieur Feuillet. Gale Ecco. (Original work published 1721)

Franko, M., & Nicifero, A. (2018). Choreographing Discourses. In M. Franko & A. Nicifero (Eds.), *Choreographing Discourses* (pp. 13–29). Routledge. https://doi.org/10.4324/9781351227384

Fokin, M. M. (1912a). "Blue God" – choreographer's development – *Archive of M. M. Fokin. P11/46*. http://lib.sptl.spb.ru/ru/nodes/766-siniy-bog-baletmeysterskaya-razrabotka

Fokin, M. M. (1912b). "Judith" – choreographer's development of dances for the opera. *Archive of M. M. Fokin. P11/57*. http://lib.sptl.spb.ru/ru/nodes/772-yudif-baletmeysterskaya-razrabotka-tantsev-dlya-opery

Gaiduk, V. L. (2016). The System of Theatre Recording in the Meyerhold State Theatre. *Izvestia of the Ural Federal University. Series 2. Humanities and Arts*, *18*(1(148)), 255–264. https://doi.org/10.15826/izv2.2016.1.021

Gaiduk, V. L. (2017). Experiences of fixing the theatrical moment in the 1920-1930s. In *The Moment as a Plot* (pp. 304–3114). Batasova Publishing House.

Goodman, N. (1976). Languages of Art (2nd ed.). Hackett Publishing Company.

Gorsky, A. A. (1899). *Tablitsa Znakov dlya Zapisyvaniya Dvizheniy Chelovecheskogo Tela po Sisteme Artista Imperatorskikh S. Peterburgskikh Teatrov V. I. Stepanova* [Table of Signs for Recording the Movements of the Human Body According to the System of the Artist of the Imperial St. Petersburg Theaters V. I. Stepanov]. Imperial St. Petersburg Theater School.

Gorsky, A. (1978). *Two Essays on Stepanov Dance Notation* (R J. Wiley, Trans.). CORD Special Publication.

Guest, A. H. (1990). Dance Notation. *Perspecta*, *26*, 203–214. https://doi.org/10.2307/1567163

Guest, A. H. (2006). Dance notation. In *Britannica*. https://www.britannica.com/art/dance-notation/additional-info#history

Hall, F. (1967). Benesh Notation and Ethnochoreology. *Ethnomusicology, 11*(2), 188. https://doi.org/10.2307/849817

Heyward, A. (2015, Feb. 4). How to Write a Dance. *The Paris Review:* https://www.theparisreview.org/blog/2015/02/04/how-to-write-a-dance/

Hutchinson-Guest, A. (1984). *Dance Notation: The Process of Recording Movement on Paper*. Dance Horizons.

Kiss, D. (2014). Interpréter le «Menuet performd' by Mrs. Santlow» [Interpret the "Menuet performed' by Mrs. Santlow»]. *Recherches En Danse, 2*. https://doi.org/10.4000/danse.343

L'Abbe, A. (1991). A New Collection of Dances. In *Music for London Entertainment 1600-1800. Vol.2* (pp. 17–21). Stainer & Bell. (Original work published 1725)

Laban, R. (1926). *Choreographie*. Diederichs.

Lorin, A. (1686). *Livre de Contredance Présenté au Roy présenté à Louis XIV* [Contredance Book Presented to King Louis XIV]. [Manuscript] https://gallica.bnf.fr/ark:/12148/btv1b9060096v/f43.item#

McGuinness-Scott, J. (1983). *Movement Study and Benesh Movement Notation: An Introduction to Applications in Dance, Medicine, Anthropology, and Other Studies*. Oxford University Press.

Misler, N. (2004). *'The Art of Movement'. Catalogue Spheres of Light–Stations of Darkness. The Art of Solomon Nikritin.* State Museum of Contemporary Art, Thessaloniki.

Mirzabekiantz, E. (2016). Benesh Movement Notation for Humanoid Robots? In J.-P. Laumond & N. Abe (Eds.), *Dance Notations and Robot Motion. Springer Tracts in Advanced Robotics 111* (pp. 299–317). https://doi.org/10.1007/978-3-319-25739-6_14

Morilla, M. (2021, January 23). *Las Partituras del Movimiento* [The Scores of the Movement]. https://thecorporealturn.com/las-partituras-del-movimiento/

Murphy, A. (2021). Book review: Kinesemiotics : Modelling How Choreographed Movement Means in Space. *Multimodality & Society*, *1*(2), 238–241. https://doi.org/10.1177/26349795211004874

Negri, C. (1602). *Le Gratie d'Amore*. http://www.pbm.com/~lindahl/negri/

Nikritin S. (1922). Programmi I zapisi zaniatiy masterskoi Proectzionnogo teatra. [The Programms and Notes of the Lessons at the Projection Theater]. *RGALI*, f. 2717.

Otis, E. (1979). Sutton Movement Shorthand Dance Writing. In *New Directions in Dance* (pp. 179–187). Elsevier. https://doi.org/10.1016/B978-0-08-024773-1.50021-3

Papadopoulou, F., & Schulte, M. (2016). Movement Notation and Digital Media Art in the Contemporary Dance Practice. *Proceedings of the 3rd International Symposium on Movement and Computing*, 1–7. https://doi.org/10.1145/2948910.2948929

Pchelkina, L. (2013). The Biomechanics of Voice and Movement in the Solomon Nikritin's Projection Theatre (1920s). In D. Zakharine & N. Meise (Eds.), *Electrified Voices. Medial, Socio-Historical and Cultural Aspects of Voice Transfer* (pp. 149–163). V&R unipress.

Petipa, M. (1971). *Materialy. Vospominaniya. Stat'i* [Materials. Memories. Articles]. Iskusstvo. https://wysotsky.com/0009/180.htm#13

Portnova, T. (2016). Choreography Sketches as a Representational System of Dance Recording: From M. Petipa to M. Fokine. *Indian Journal of Science and Technology*, *9*(29), 1-5. https://doi.org/10.17485/ijst/2016/v9i29/88740

Ratmansky, A. (2018, Nov., 27). Petipa PS. *Theater*. http://oteatre.info/petipa-ps/?

Rezhissorskiye ekzemplyary K.S. Stanislavskogo [Director's cuts by K.S. Stanislavsky] (1994). Atheneum–Phoenix. https://library.mxat.ru/epub_epdf/rezhisserskie_ekzemplary_stanislavskogo.dyadya_vanya_chehova.pdf

Russell, T. (Ed.). (2020). *Dance Theory. Source Readings from Two Millennia of Western Dance*. Oxford University Press. https://doi.org/10.6092/issn.2036-1599/14137

Saint-Léon, A. (1852). *La Sténochorégraphie, ou l'art de noter promptement la danse* [Sceno-Réography, or the Art of Recording Dance]. https://gallica.bnf.fr/ark:/12148/bpt6k56841007.texteImage

Salaris, P., Abe, N., & Laumond, J.-P. (2017). Robot Choreography: The Use of the Kinetography Laban System to Notate Robot Action and Motion. *IEEE Robotics & Automation Magazine*, *24*(3), 30–40. https://doi.org/10.1109/MRA.2016.2636361

Schreyer, L. (1920). *Kreuzigung: Spielgang Werk VII.* Werkstatt der Kampfbühne.

Schreyer, L. (2001). *Theateraufsätze* (3rd ed.). Edwin Mellen Press.

Shannon, L. (1996). Simple Dances: Where Do They Come From, Where Do They Lead? https://www.laurashannon.net/articles/16-simple-dances-where-do-they-come-from-where-do-they-lead-1996

Smirnov A. (2013). *Sound in Z. Forgotten experiments in Sound and Electronic Music in Early 20th century Russia*. Sound and Music, Koenig Books. https://monoskop.org/images/6/63/Smirnov_Andrey_Sound_in_Z_Experiments_in_Sound_and_Electronic_Music_in_Early_20th_Century_Russia.pdf

Smoliar, S. W., & L. Weber. (1977). Using the computer for a semantic representation of labanotation. *Computing in the Humanities*, 253–261.

Stepanov, V. I. (1892). *Alphabet Des Mouvements Du Corps Humain* [Human Body Movement Alphabet]. Imprimerie M. Zouckermann.

Strauss, G. B., Wing, C., & Yuen-wah, L. (1977). Translated Excerpts of Chinese Dance Notation. *Dance Research Journal*, *9*(2), 5. https://doi.org/10.2307/1478062

Sutton, V. (1981). Sutton Movement Writing and Shorthand. *Dance Research Journal*, *14*(1/2), 78. https://doi.org/10.2307/1477966

Sutton, V. (n.d.) History of SignWriting. . https://www.signwriting.org/archive/docs2/sw0161_History_of_SignWriting.pdf

Taplin, D. T. (2014). *New Directions in Dance: Collected Writings from the Seventh Dance in Canada Conference Held at the University of Waterloo*. Elsevier.

Tchaikovsky, P. I. (Composer). (n.d.). *Sleeping beauty (Choreographic work : Petipa). Stepanov dance notation score: autograph manuscript*. Houghton Library. https://iiif.lib.harvard.edu/manifests/view/drs:48731881$183i

Tomko, L. J. (1999). Dance Notation and Cultural Agency: A Meditation Spurred by Choreo-Graphics. *Dance Research Journal*, *31*(1), 1–4. https://doi.org/10.2307/1478304

Tomlinson, K. (1735). *The Art of Dancing explained by Reading and Figures*. [Printed for the author].

Umino, B., Longstaff, J. S., & Soga, A. (2009). Feasibility study for ballet e-learning: automatic composition system for ballet enchaînement with online 3D motion data archive. *Research in Dance Education*, *10*(1), 17–32. https://doi.org/10.1080/14647890802697171

Varpakhovsky, L. (1935). Hodomer. Opyty zapisi spektaklya [The Stepmetre. The Experience of Performance Recording]. *Sovetskoe Iskusstvo*, *39*(3).

Varpakhovsky, L. V. (1978). *Nablyudeniya. Analiz. Opyt* [Observations. Analysis. Experience]. VTO. http://teatr-lib.ru/Library/Varpahovsky/exp/

Watts, V. (2015). Benesh Movement Notation and Labanotation: From Inception to Establishment (1919–1977). *Dance Chronicle*, *38*(3), 275–304. https://doi.org/10.1080/01472526.2015.1085227

Wolf., K. (2017). La Notation de mouvement Benesh pour les Arts du Cirque : Développement d'un Langage Artistique et Disciplinaire à Partir d'un Alphabet [Benesh movement notation for circus arts: development of an artistic and disciplinary language from an alphabet]. *Corps*, *1*(15), 329-336. https://doi.org/10.3917/corp1.015.0329

Zorn, F. A. (1905). *Grammar of the Art of Dancing*. Heintzemann Press.

Yuzurihara, A. (2014). Historical and Contemporary Schrifttanz: Rudolf Laban and Postmodern Choreography. *Dance Chronicle*, *37*(3), 288–311. https://doi.org/10.1080/01472526.2014.957628

СВЕДЕНИЯ ОБ АВТОРЕ / INFORMATION ABOUT THE AUTHOR

Даниил Вырыпанов, vyrypanov.da@edu.spbstu.ru
ORCID 0000-0002-9369-9599

Danil Vyrypanov, vyrypanov.da@edu.spbstu.ru
ORCID 0000-0002-9369-9599

Статья поступила 15 мая 2022
одобрена после рецензирования 6 июня 2022
принята к публикации 10 июня 2022

Received: 15 May 2022
Revised: 6 June 2022
Accepted: 10 June 2022