

**BACH AND NEWTON: ARTISTIC PARALLELS
(ABOUT THE CREATIVE CONTENT OF THE URTEXT
OF THE INVENTIONS AND SINFONIAS)***

very professional musician and admirer of the music of the great Johann Sebastian Bach knows that the composer's works demonstrate him not only as an artist and composer, but also as a "scientist in music," who was able to combine in an ingenious way the laws of artistic reflection of the world with the laws of logic and mathematical constructions. By means of intricate details of the process of sound he modeled space, time and motion and manifested in artistic form numerous discoveries, which were in many ways analogous to the inventions of his contemporary, Isaac Newton. In his turn, the creator of classical mechanical laws gravitated towards artistic methods in his scientific methods. Thus, Newton, similarly to many great thinkers of the past, aspired to express the profound laws of the world in an artistic literary form. Albert Einstein wrote about Newton: "He combined in one person an experimenter, a theoretician, a master and to no degree less an artist in his exposition. His joy of creation and lapidary precision are demonstrated in every one of his words and images" [5, p.116]. Few people attach importance to such a hardly conspicuous circumstance that Bach, in the manner of a scientist and inventor, in his composing method made use of methods of the exact sciences – physics and mathematics – and also "discovered" and reproduced in music many regular laws of physical types of motion, including mechanical laws. In his instrumental works, particularly in his instructive pieces for clavier, he manifested in sound imagery practically all the types of mechanical motion that were studied at that period of time: *ascending and descending*, *running*, *spherical*, *laminar*, *helical*, *incremental*, *sinusoidal*, etc. He also focused his attention on the scientific nature of the wavelike patterns of oscillatory motions. In his Inventions and Sinfonias the composer constructs in the form of sound the principle of the work of a pendulum (the

Invention in F major and the Sinfonia in B minor), while many of his other Inventions and Sinfonias establish not only the various types of motions, but also the means of transmission of the systems of tension or voltage systems connected with them. In other words, in a way parallel to Newton, Bach "carried out research" of the laws of nature and the Universe, having penetrated in an ingenious way into the very essence of the motion of matter, having draped into musical form a large quantity of combinations which reflected the connections of the models of motion in the outer world [4, p. 36–45]. As a researcher of space and time, Bach takes on the role of a "pioneer-scientist," arraying in the elaborate logic of its constructions the artistic picture of the world, nature and the Universe.

As a composer and performer Bach was concerned about the issue of perfection of performance, which he also examined as an issue of perfection of the quality of the construction of musical instruments. He promoted the idea of the possibility of combination in one musical instrument of keys differing in the level of pressure, which would also vary in their configuration (circular, square, etc.). Moreover, he also experimented with combining different timbres. Bach invented the "lute-harpsichord" (Lauten-Klavier), sketching it out and asking instrumental master S. Hildebrandt to manufacture it. In Mulhausen he constructed pedal chimes for the St. Classius organ, thereby solving on the level of an inventor the problem of correlation of physical efforts with the depth of sound.

The composer's lifetime coincided with a period of transition towards use of new musical instruments capable of playing in the well-tempered scale. Bach was one of the first musicians to realize the immense historical significance of this reform and took a direct active part in inactivating it. It consisted not only in composing musical works,

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such as, for instance, the “Well-Tempered Clavier,” but also in searching for a technology for building new musical instruments. Technical invention was one of Bach’s main points of interest, even though he tended work slowly and with difficulty on his inventions, according to the observations of Albert Schweitzer observations. In any case, the solution of such specific artistic tasks helped disclose the synthesis of the composer’s logical-constructive approach with his artistic thinking.

Bach’s breadth of scope and artistic activities also revealed the special attention on his part towards the mathematical disciplines. The composer’s personal library included a collection of old books on mathematics, which he studied thoroughly. Reading these books strengthened the logical, conceptual mode of his thinking, while yet another sphere of artistic activity – namely, poetry – served as a source of his artistic inspiration. It is well-known from a number of sources that Bach wrote poetry in the Saxon dialect. Unfortunately, his poetic works have not been preserved up to the present time; neither are the subjects, means of versification or content of Bach’s poetical oeuvres known. However, some perception of the literary method of exposition of thoughts is provided by various documents: the composer’s personal and business correspondence, memorandum and consistories. In these, just as in the composer’s musical language, there is a perceptible sense of logic, clarity and plasticity and a lack of false pathos and agglomerate of words. It could be said that Bach’s poetic essays are similar to Newton’s avocation with painting, by means of which he gave representation to many of his scientific designs. The need to depart from the tight framework of professional specialization arose for the composer, as well as for the scientist, as the result of the specific qualities of their personalities, the specific level of development of their universal capabilities and the aspiration of their individual talents for various diverse forms of expression.

The outstanding aptitudes of the artist and the scientist were revealed in the Inventions and Sinfonias as pieces distinguished for their special gift of immersion into the laws of development of the physical characteristics of matter: their manifestation of time and space in the mirror models of numerous (vertical and horizontal) inversions, positions of coagulation and unfolding of the musical text – the guide towards information about the outer world.

“Inventions” was a title given to pieces in which it was necessary to emphasize the element of

novelty, inspired ideas, discoveries, etc. From one perspective the composer’s choice of the title for his set pieces was made very accurately by him, since his Inventions are really full of inventiveness, sharp-witted combinations and “artifice.” This assertion can be validated by the fact that the first 15 pieces (the “Inventions” or “Two-Part Inventions”) are endowed with a graphically fixed, short-hand notation of horizontal and vertical semantic oppositions. This short-hand text may be unfolded by the performer into different diverse variants of a secondary musical text (the performer’s musical scenario) with a change in the initial content and modifications of the previously set semantic structures. It is not perchance that the 15 pieces forming the second half of the cycle – the 15 Three-Part inventions – were called “Sinfonias.” The title indicates at most concrete score instructions contained in the notation, differing from a “short-score” reduced to a two-staff system in the Inventions. As a rule, this creates stylistic allusions to the sounds of chamber combinations of vocal and instrumental trios with single-timbre (Sinfonias No. 1–3) or many-timbre (No. 4–14) indicators of quasi-orchestral meanings of acoustic images codified in the musical text.

On the one hand, the urtext of the Inventions presumed a varied statement from the start, being essentially a shortened type of notation. On the other hand, its unfolding is maintained by the composer’s version, the semantics of intonational formulas of which defines the primary meaning, which is important in the rendition of the situation created by the performer. For a musician who turns his or her attention to the Inventions and Sinfonias, it is quite possible to immerse into their artistic domain by means of the process of modification and transformation of the specified semantic oppositions. From this perspective and from this point of view working on the Inventions and Sinfonias presupposes fulfilling two main goals. One of this – posing the traditional problem of interpretation – is the *re-intonating* of the musical text by means of “regulators” of meaning – tempo, dynamics and articulation. In this case the Inventions and Sinfonias, being essentially instructive pieces, may be viewed as repertoire compositions for solo performance of the composer’s musical text.

The opposite goal consists in the technique of restatement of the urtext with the use of the technology of unfolding a short score into a full score. To carry out the latter task in contemporary conditions two pianos would be needed with the participation of two

performing partners, which would expand the timbre-coloristic possibilities of the action of transforming the short-score into a full score.

When turning to Bach's clavier music legacy, the theory and practice of performance pays attention only to the first question, at that, exclusively in the aspect of articulation, which is examined with no connection to semantic analysis or the semantic deciphering of the subject or meanings of intonation and lexis. This assertion provides the foundation for different variant renditions of the same intonation with diverse shades of meaning. At the same time, the semantic categories themselves as well as their oppositions may be revealed in the utterances text by means of semantic analysis, which creates artistic motivation and would set the goals of articulation in a more precise way. Let us notice that restatement of the musical text does not presume notating all of its numerous variants and is not written down, but exists as an "oral" musical-verbal form of activity.

The process of the performer's "initiation" into the unusual technology of the transformation of the primary text may be conditionally divided into several stages, each of which forms the algorithm of realizing "the short-score into the full score."

The chief operating element in this process is that of semantic oppositions, which are present in the musical text of any composition from the Baroque period. In the context of the Inventions and Sinfonias these structural units, by being frequently repeated and recognized, carry out the role of situational signs, models of ensemble music making, which migrate from one musical text to another. The performer is required to fulfill two goals: to master the technique of analysis of semantic oppositions and to learn the means of re-exposition with the use of techniques of doubling, registration, ornamentation and mirror-retrograde shifts of dialogic structures.

On the first stage it is possible to make use of elementary didactic procedures: after becoming familiarized with the musical text of the score, instead of the traditional "playing the counterpoint, voice by voice" to learn the text by means of "reading off" each semantic opposition separately from the lines of the musical notation, regardless of where they are situated on the staves of the musical score. For example, in Invention No. 4 in D minor, as well as in a number of others – No. 1 in C major, No. 3 in D major, No. 8 in F major, etc., the semantic opposition of *solo* – *continuo* is apparent. But while in the actual folk dances the position of each of the

aforementioned parts was located on separate lines or in one voice, in the Inventions and Sinfonias their positions are combined in a more intricate way.

Upon unfolding the urtext, it is important to bring out in the musical text of the position of each semantic segment permeating the oppositions, meaning that the semantic segment is not always equal to a contrapuntal voice, which is why it may be notated on different staves of the systems and pass from one line to another. Let us examine this process on the example of Invention No. 1 in C major. At first the performer would play, for example, the continuo part with its traditional combination of timbres of lower strings and cembalo, then the part of the soloist, which provides ornamentation to the basis and carries out the task of imitation of the sound of the harpsichord (the problem situation "How would this sound on a harpsichord?"). Upon the first performance the thematic replies are performed by two hands alternately, as is written in the musical text. When the technique of "reading out" is mastered well enough, it would be possible to perform the piece together with a partner. In this case, the continuo will sound in the low register, while the solo part would sound in the upper voice.

The process of the subsequent mastering of the piece would take place with a permanent partner; a performance of the Invention on two instruments would also be highly desirable. In this case, one of the partners would perform the part of the continuo by making use of the techniques of doubling and registering, while the other would play the "solo part on a harpsichord" – i. e. the ornamented line. For imitation of the continuo sound it is necessary to double the part in octaves and to transfer the sound of the upper line into the lower register. The position of the soloist's part in the upper register is corresponded with the content of the ornamental melody in its "harpsichord" version of sound. The effect will be enhanced if the melody will be supplied with melismas on the basic strong beats of the measure.

During their preliminary work, it is necessary for the performers to learn to see and to disclose in the three-part texture the dialogic structure with the functionally opposing semantic lines, consisting of the ornamental line (*solo*) and the foundation in the bass (*continuo*).

After that it becomes necessary to carry out a semantic analysis of semantic oppositions and to determine the intonation-related lexis.

This is no less significant a process, since the possibility of variant-related transformation of

the semantic oppositions depends on the content of intonation-related lexis. Thus, for example, in Invention in D minor (No.4) the foundation of the continuo is comprised by the “rhythm of pace”: notwithstanding the triple meter, the figure acquires a semantic effect of an “image of a procession” as the result of interaction with a concise common meter of two- and four-measure units of division. The “rhythm of pace” discloses itself through the ostinato, which repeats unalterably while accompanying a constantly changing (varied) solo part. The incorporation of the “figure of the cross” in the strong beats of mm. 1–4 and 3–6 of the musical text highlights the doleful tragic character of the content of the piece and may be associated with the Biblical story told in the Gospels. The “figure of the cross” is encoded into the music and consists of four pitches presented in concealed form and may be revealed from out of the overall current of the ornamental motion by means of articulation. The solo part presents a semantic opposition to the “rhythm of pace” and is presented as an element of ornamentation. In the examined Invention the element of ornamentation is unfolded by means of incorporation into the musical text of the technique of diminution. After having reduced the written out diminutions into matrix-like schemes, the performer will once again run across the “figure of pace.” Thereby the initially opposing semantic constructions turn out to be structures that are inwardly close to each other and mutually complementary. In the present example a secondary image appears, which is dolefully tragic and at the same time lyrical, demonstrating the basic principles of unfolding the musical intonation in this Invention. However, if the impact of one of the “regulators” of meaning – the tempo, articulation or dynamics – is enhanced, this would generate *new content*, which would appear as a result of this interaction. The latter may be proven by the redaction (i. e. interpretation) carried out by Ferruccio Busoni, bearing the tempo *Allegro deciso* (fast and decidedly), dynamic markings with a predominance of *forte*, and articulation following the principle of playing “the eighth notes staccato and the sixteenth notes legato.” In this case the Invention would sound fast, brightly and rather airily, almost in the manner of a scherzo. The redaction (interpretation) of Busoni essentially demonstrates the mechanism of transformation of the musical text, since it changes radically the meaning initially established in the intonation vocabulary. It is quite apparent that there may be multifold variants of

interpreting the text, but everything must depend on the semantic contents established in the text, and the main criteria for authenticity must be demonstrated by the urtext.

An analogous construction of semantic oppositions of the various segments of the musical text is contained in Invention No.8 in F major. In pedagogical practice it is customary to regard it as a technical contrapuntal composition, in which by following the rules of articulation it is necessary to follow concisely the rule of “eighth and sixteenth notes.” It would seem that there is no cause for objection here. However, let us attempt to look at the urtext of this composition in a different way. It would be logical to presume that upon selection and connection of two rhythmic figures opposite to each other, the composer could have based himself on the tradition of manifestation of several concepts-symbols which existed in the artistic and philosophical consciousness of the epoch. In the given situation it could have been the perception of time in the physical space expressed in a concrete image – the mechanism of a clock. One of the most important symbols was presented by the “principle of the pendulum,” which conveys the idea of even motion and steady balance. A similar manifestation of the category of space and time was also presented in Sinfonia No. 15 in B minor. Here the meter and the rhythm express a persistently accented pulsating motion of time and a “circling” of the rhythm, not fettered by indications of tempo or time.

An important peculiarity of research work on the Sinfonias is the ability to view the transmigration of models, where the primary opposition may pass from one voice to another, from one line of the musical text into another, at the same time intensifying the meaning of one combination or another or transforming in a mirror-like fashion into its opposite: solo or continuo, depending on either the situation of music making or that of preserving the musical text. A number of the Sinfonias (for example, No. 4 in D minor) contain images of vocal lines – i. e. the vocal duo of soprano and alto. The continuo part resembles an instrumental ensemble accompanying the vocal lines. On a similar basis related to the subject and semantics, careful study may be made of Invention No. 9 in F minor, in which the intonation-related vocabulary reminds of many arias for alto voice from Bach’s cantatas and Passions. A similar image is also contained in Sinfonia No. 11 in G minor, which is based on imitation and calls-over of two independent vocal

parts. In Sinfonia No. 10 in G minor the ostinato pattern presents a rhetorical figure – the bass formula, common to many of Bach’s compositions. In this case, performers of this intonation-based etude may distribute the roles in the following manner: the first performer may take the ostinato pattern, while the second may play the ornamented melody. To achieve a full-score ensemble quality of sound, the performer of the ostinato part must apply the technique of octave-doubling, while the soloist, taking into account the process of choosing the quasi-timbres, must double the melody and make use of register transfers. It is possible to work the same way with Sinfonia No.9 in F-minor, in which Bach makes use of the *passus duriusculus* as an ostinato figure.

Thus, in the process of performance of Bach’s Inventions and Sinfonias it is possible to keep in mind along with the interpretation of the primary musical text also the idea of further work on it in

terms of transforming the music. The latter presents an important element in the path towards developing an individual ingenuity, which Bach instructed us by having created independent versions on the basis of the technology of unfolding the primary musical text on the basis of variation. This process is carried out by means of semantic oppositions, which are present in each one of the Inventions and Sinfonias in the form of contextual signs and images of music making, and give ground for manifestation of the imaginary subject matter in each of them.

The formation of the skills necessary for this kind of rendition of the musical text may occur following the crucial scheme of “short score-full score” or “folding-unfolding,” as the result of which the performer, similarly to the composer, also becomes an artist or creator with a free mastery of the technique of achieving the goal of acquiring ingenuity and capability of working creatively with the musical text.

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Bach and Newton: Artistic Parallels (About the Creative Content of the Urtext of the Inventions and Sinfonias)

The article elaborates on how J. S. Bach, parallel to Newton, “researched” the laws of nature and the Universe. In his sound process he modeled space, time and motion and manifested in artistic form discoveries in many ways analogous to the scientific inventions of his contemporary. Bach, similarly to Newton, showed himself as a “scholar-pioneer,” who constructed in the logic of his constructions an artistic picture of the world, nature and the Universe. He rendered in the music of the “Inventions and Sinfonias” images of mechanical motion, which were studied at that same time in physics: ascending and descending, “running,” spherical, laminar, obtrusive, incremental, sinusoidal, etc. He even imprinted the wave-like nature of oscillating motions in the acoustical image of the work of a pendulum (the Two-Part Invention in F major, the Three-Part Invention in B minor).

The Inventions are distinguished by their special attribute of penetration into the laws of the physical qualities of matter: here the numerous models of folding and unfolding of the musical text demonstrate forms of alteration of time and space, which are bearers of information about the outer world. It is not perchance that the pieces in the second half of the cycle, namely, the 15 Three-Part Inventions, are called Sinfonias. The subtitle indicates at the quite concrete characteristic features of the score, which presents a musical equivalent of a volumetric tridimensional space. They may be realized in a musical score for ensemble on the basis of numerous modifications of vertical and horizontal oppositions of the acoustic images of solo and continuo. The same characteristic features are contained in the essentially stereophonic voluminous musical text of the Inventions and Sinfonias, convolved into a two-staff short-score, which may be explicated by the performer into various versions of a derived ensemble score.

Keywords: J. S. Bach and Newton, Inventions and Sinfonias, baroque music making, baroque ensemble practice, creative music making.

Бах и Ньютон: художественные параллели (о креативном содержании уртекста Инвенций и Синфоний)

В статье показано, как И. С. Бах, параллельно Ньютону, «исследовал» законы природы и Вселенной. Через звуковой процесс он моделировал пространство, время, движение и воплотил в художественной форме открытия, во многом аналогичные изобретениям своего современника. Бах, как и Ньютон, выступил в роли «учёного-первооткрывателя», выстраивая в логике своих конструкций художественную картину мира, природы и Вселенной. Он воспроизвёл в музыке Инвенций образы механических движений, изучаемых в это время физикой: восходящее и нисходящее, «бегущее», сферическое, ламинарное, винтовое, поступательное, синусоидальное и др. Им запечатлена также волновая природа колебательных движений в акустическом образе работы маятника (двухголосная Инвенция *F dur*, трёхголосная Инвенция *h moll*).

Инвенции отмечены особым даром проникновения в законы развития физических свойств материи: здесь в многочисленных зеркальных моделях свёртывания и развёртывания текста показаны формы изменения времени и пространства – проводников информации о внешнем мире. Не случайно вторая половина цикла из 15 трёхголосных инвенций названа «синфониями». Заголовок указывает на содержащиеся в записи вполне конкретные признаки партитуры – музыкального эквивалента объёмного трёхмерного пространства. Они могут быть реализованы в ансамблевую партитуру на основе многочисленных модификаций вертикальных и горизонтальных оппозиций акустических образов solo и continuo. Те же признаки содержит и свёрнутый в двустрочник – по существу стереофонически объёмный текст двухголосных Инвенций, который может быть развёрнут исполнителем в различные варианты вторичной ансамблевой партитуры.

Ключевые слова: И. С. Бах и И. Ньютон, Инвенции и Синфонии, барочное музицирование, ансамблевая практика барокко, креативное музицирование.

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