

"Inside a Pipe Organ" – Sketch by KPW

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Independent Research Project

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Applying the Goethean Scientific Method in Pipe Organ Tonal Finishing

with other philosophical and practical ideas

applicable to artistic voicing work

The opening of this presentation begins with recordings of two very contrasting pieces by Johann Sebastian Bach for organ. They provide a brief orientation to the musical effect of the organ and its widely varying tonal and expressive possibilities. It is recommended that readers have their computer or phone online, with good headphones or a quality audio system, so that they can experience the sounds described here.

The first, “Komm, heiliger Geist, Herr Gott” – BWV 651, illustrates the so-called full plenum of the organ, which along with the deep 32-foot stops in the pedal encompass the outer limits of human sound perception, from the very lowest to the very highest pitches. It is a piece of highly exuberant, glorious character, which portrays the day of Pentecost when the Holy Spirit appeared to the Disciples “in tongues of fire.” This performance is by the organist Leo van Doesselaar, on the great Flentrop organ of Hauptkirche Sankt Katharinen, Hamburg, Germany.

<https://www.youtube.com/watch?v=6bpTlw19PcI>

The second, “Wenn wir in höchsten Nöten sein” - BWV 641 in contrast illustrates the effect of quiet flute and principal stops, which offer comfort and introspection. This very text and melody is the one that Bach chose to contemplate and use for his last composition on his deathbed. Here it is played by the organist Wolfgang Zerer, on the marvelous, historic Schnitger organ of the Martinikerk, Gröningen, Netherlands

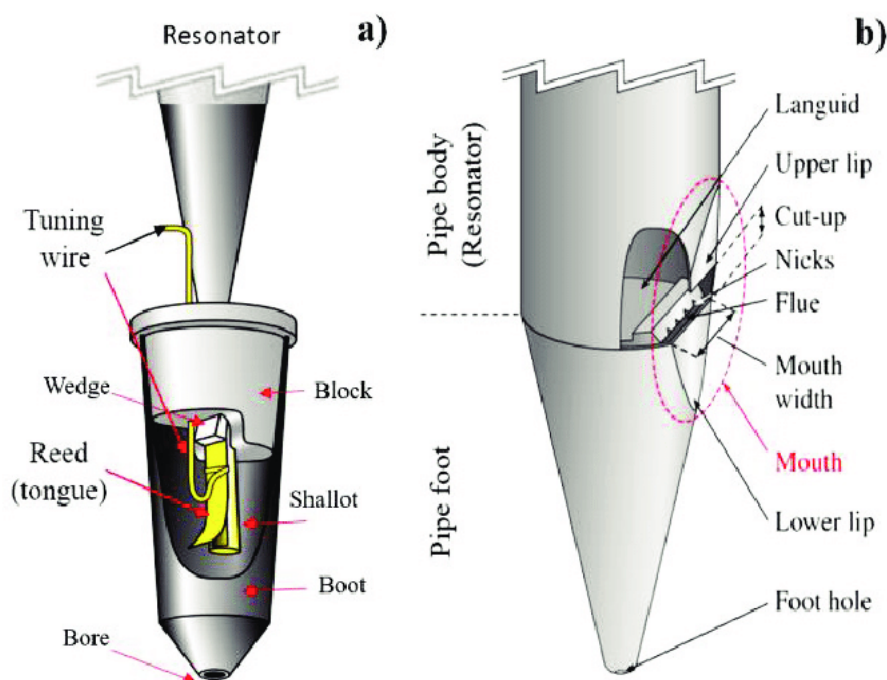
<https://www.youtube.com/watch?v=GG4VRpmZdR4>

Friedrich von Schiller wrote in his fifteenth of the Letters Upon the Aesthetic Education of Man: “A marble block, though it is and remains lifeless, can nevertheless become a living form by the architect and sculptor...”¹ Reworded to apply to organs, one could likewise say: “Organ pipes, though they are and remain lifeless, can nevertheless become living tones through the art of the voicer.”

The art and craft of tonal finishing – also referred to as voicing - involves beautifying, refining and balancing the effect of each individual pipe, in optimal relation to the acoustic and the performance situation. Each pipe achieves its own potential -

balanced and in harmony in relation to the rest of the pipes of that stop, and the whole organ of which it is a part.

Although this presentation is intended to address the thought process and artistic / philosophical aspects of pipe organ tonal finishing - not the techniques used to manipulate and shape the pipes – nevertheless, it should be mentioned that achieving these goals involves very exact shaping of parts of the pipe, and minute adjustments to modify the tone produced. Here is Péter Rucz's diagram ² of the basic construction of reed (left) and flue (right) pipes, together with the English names for their parts (please note that the Bore on a reed pipe, and the Foot hole on a flue pipe are also commonly referred to as Toe holes):



As the voicer works to express the concept of a stop in eloquent and beautiful tone, there should always be a feeling of responsibility. Such an attitude is an essential prerequisite to achieving the highest possible standard in the art. There is the need to have an inner ear guiding to the tonal ideal, be it a flute stop, a principal, a trumpet, an oboe, or a string. Although every stop will have very slight inconsistencies and imperfections, despite these the purity of the ideal must shine through. When the voicer does this skillfully and with good intent the imperfections can be overcome, and the tone will still speak to the listener in its purity. When finishing an organ stop, the pipe

voicer and the console voicer try to achieve a level of perfection that is so subtle that the average listener – and ideally even the well-trained musician – will hear no inconsistencies. As they practice their craft and art there should be an awareness that what is being created is the tonal aspect of every musical performance for the ages to come. One must honor the best examples out of the past, and uphold the standard, at least meeting and preferably exceeding it. Thus the art of voicing, which has existed since Roman times, is honored and carried on.

There is the responsibility to all the organists who will play this organ, all of whom will need to utilize these sounds that are of necessity capable of making beautiful music. After all, the way the stop is left at the end of voicing is the tonal performance for the life of the instrument, barring a re-voicing. At the same time, voicers are responsible to the listener, because this is what – for better or worse – will be heard for the next century or longer. All the people who hear it will be affected either positively or negatively according to the quality of the sounds that the voicer has given the world. In the case of small venues it will be thousands of people. In the case of large churches, cathedrals, and concert halls it will eventually number in the hundreds of thousands. Therefore, tonal finishing has to be accomplished with great care and a vision toward the future. Not only will organists use, and audiences hear the results of one's work, but other organbuilders may well come to examine the results. Sometimes the achievement is outstanding enough that other voicers will attempt to pattern their own work after it. Truly artistic voicing should be a worthy tribute to the past, a joy and inspiration to performers and audiences alike in present-day performances, and an example for the future of the art. Such is the responsibility of the voicer.

Here is a brief introduction to the four primary stages of the Goethean Scientific Method, distilled from the writing of Isis Brook. ² These are:

- 1) Exact Sense Perception - Determining what is, without evaluation or opinion; also called Observation.
- 2) Exact Sensorial Imagination Exploring the unique possibilities that present themselves; also called simply Imagination.
- 3) Revelation of Character or Inspiration - Achieving a unified expression and understanding of the full character of the phenomenon.

4) Becoming One with or Intuition - After extensive experience with many occurrences of the phenomenon, one comes to a profound understanding of its essence.

Brook says that these need to be preceded by a stage called Preparation. This involves acknowledging first impressions, and an awareness of what past experiences and personal preferences one brings to the work. In practical terms, it is a good idea to jot down one's thoughts and reactions to what was heard in an initial hearing, so that they can be laid aside, in order to free up and concentrate on the stage of Observation. But thereby one has them available for future reference, because a quick reaction can in the long run lend valuable insight, and point the way to important direction to take in the work. ³

The four steps of the Goethean Scientific method can be related directly to and utilized in the process and art of pipe organ tonal finishing.

Stage 1 Observation According to Isis Brook, "This stage was called by Goethe Exact Sense Perception and is characterized by a detailed observation of all the 'bare facts' of the phenomenon that are available to our ordinary senses. It is an attempt to see what is present with as little personal judgement and evaluation as possible. All our theories and feelings about a thing must be held back in order to let the facts speak for themselves."³ In tonal finishing work, one looks for knowledge of just what is being dealt with in terms of the physical construction of a stop, how it fits into the overall tonal concept of the organ, and what acoustic the organ is sounding into. It involves an awareness of the situation in its many aspects and details, withholding personal judgment and evaluation, discovering "what is." Among the many things to consider are these:

- ☐ Acoustics: amount of reverberation, relative clarity, promotion or attenuation of various frequencies. This may (and preferably will) include an acoustician's report. If there are "hot" spots in the space, or places where the sound is muted, that needs to be recognized.
- ☐ Size of room, seating capacity
- ☐ Use of organ: church services, concerts, teaching, entertainment

- Specification and overall concept of the organ, including musical style, i.e., nationality, period, eclectic; style can also apply to individual stops
- Type of key action (mechanical, assist, electropneumatic, electric etc.)
- Wind pressure, character of wind supply (bellows, windlines, reservoirs, wind stabilizers)
- The type of stop: principal, flute, string, trumpet, oboe, krummhorn etc.
- The scaling of the stop: diameter at Cs, tapering if any, harmonic length if employed
- Which materials: lead / tin and proportions of each, or wood, or zinc, copper etc.
- Other details of pipe construction: form of mouth, mouth width in proportion to circumference, thickness of metal / wood, thickness and angle of languid, type of shallot; reed thickness, length and width etc.
- Schedule of specifications for pipe preparation: toe hole sizes, cutups, open / closed flues, nicking, overshot, reed dimensions, shallot construction
- Relationship to other stops in the division and the whole organ, intended use for solo and in combinations
- Placement of pipes within organ, including windchest layout; and spatial relation of the organ to the building

The more general aspects such as space size, concept of the instrument, and acoustic assessment usually only need to be done once for the organ, whereas the ones pertaining to a single stop will need to be reviewed for each set of pipes.

Stage 2 Imagination (also called Exact Sensorial Imagination) “The second stage could be seen as a training of the imaginative faculty in two directions: First to free up the imagination and then to constrain it within the realms of what is possible for the phenomenon being studied.” - Isis Brook ³

In organ tonal finishing, this involves exploring and identifying the uniqueness of the stop being voiced, and setting forth the trajectory toward creating a beautiful, refined, eloquent, and unified set of tones. One becomes aware of both possibilities and limits. Often one pipe stands out as sounding particularly beautiful or interesting, and can be used as a sample for setting the direction of that stop's effect. At the same time, the

effect has to be balanced in relation to the acoustic, what the pipe is capable of, and how it will still maintain the necessary utility in relation to music.

This is a particularly challenging, but also exciting step for the organ voicer, because this is the critical part of the process that chooses a sound that fits the set of pipes, in relation to the rest of the division and organ as a whole, and correct for the acoustic. At the same time one hopes to find a unique musical effect that gives an eloquent voice to this particular set of pipes.

In most cases the pipes will have been prepared and pre-voiced in the shop where the organ was built. After a basic tuning, the voicer and console assistant play and listen to the entire set of pipes both from the console and from out in the room. The effectiveness and appropriateness of the sound to the organ and acoustic will need to be judged, while at the same time, one looks for pipes that are outstanding in their characteristics. From such pipes, one can begin to discover the unique possibilities this given set of pipes offers.

One should seek a warm, balanced tone, at a volume that projects well into the acoustic, but does not oppress with its volume. While there can never be absolute evenness – and slight variation contributes to the beauty of the effect – there should be a very even flow from pipe to pipe. The goal is to create a unity of effect, while also allowing a subtle, flowing change from one octave to another. At no point should there be such a difference in volume that one note obscures another. Rather, there should always be a good balance of volume and tone, so that if two or three, or more notes are played together, any one of them can be heard clearly.

It is important to check the relationship to the space, and to find a balance in the tone, volume, and speech. The sound needs to project well into the room, avoiding a quality of either shyness or aggressiveness. The speech should be articulate and prompt, but not to the point that it calls attention to itself within the context of music. The pipes need to have good fundamental while not being overly dark, and at the same time good harmonic development without being overly shrill.

The voicer has the task of making something beautiful but also useful. One is limited by a number of factors. Firstly, there is the nature of, the construction of the pipes themselves. One of course cannot create a Trumpet or Principal sound from a Bourdon, or vice versa. Then also there is the expected function according to the tradition of organbuilding, organ performance and use, and the literature of the instrument. The place in the tonal scheme of the present organ must be considered. The acoustic, the size of the room, and the placement within the room all make for limitations. Finally, there is the need to balance and integrate the pipes of the stop into a unified effect.

Once a musically effective, balanced sound has been identified, normally the voicer sets at least Co, c1 (middle C pitch on a piano) and c2, trying to perfect beauty, balance, volume, tone, and speech on these notes. They will serve as samples and a reference for the next step in tonal finishing.

Stage 3 Inspiration or Revelation of Character – The process whereby the voicer builds on the basis of what has been discovered through Imagination, bringing the set of pipes to its full character of beauty, uniqueness, refinement, balance, and blend. It could also be referred to as a Fulfillment of the potential of a set of pipes, because the voicer brings the possibilities in the whole range of a set of pipes to completion. As Isis Brook describes it: “What is expressed is the being of the phenomenon, something of its essential nature.”³

The goal is to achieve a set of pipes where each pipe is in balance with itself, and all the rest of the pipes of that stop, in a sequence that makes musical sense, and speaks as an artistic continuity. Daniel Wahl characterized this process well: “The artist’s gaze continuously shifts attention between the details of the phenomena and their impression as a whole. Artists intend to intuitively understand the intimate relationship between the part and the whole; to feel the interconnection that unites all detailed diversity into a dynamically transforming whole.”⁴

Using the samples set in the second step as a starting point, the pipes are prepared one by one to align with the Cs. Often one will work chromatically through an octave of pipes at a time, attempting to create a unified flow from one pipe to the next. The goal is to have each pipe speak well in and of itself, but it is also essential that the pipes create a unified effect as a whole. In order to do that, the tone, volume, and timbre must match very well from pipe to pipe. The voicer working on the pipes inside the organ works closely with the console assistant. All along the way, after the pipes have been manipulated, the person at the keyboard must check whether the speech is prompt and clean, whether the volume is neither too loud or too soft, whether the timbre is consistent. Usually at least once an octave, the pipe voicer or the console assistant should go out into the room to check that the desired evenness and effect is being achieved. Purity is not to be compromised, except in miniscule amounts.

When voicing in the third stage, one should always be open to the possibility of discovering a pipe that is outstanding in tone or effect. In these cases, one must make a decision whether it might be wise to revert temporarily to the Imagination phase, and see if this new discovery is worthwhile implementing into the color and effect of the stop.

Balance is of utmost importance in the voicing of a stop. Because the organist can only control articulation - not volume - the stop must balance itself perfectly. One way in which this is achieved in flue stops, is by generally creating a more purely fundamental tone in the bass. That way, even when the sound is full, the overtones are not competing with the basic fundamental pitch of pipes of the next octave above, or higher. A triad sustained, while taking each note in and out in turn, will reveal if one or another pipe is too soft or too loud. Sometimes with flue stops there is a gradual slight crescendo into the treble, and the reverse with reeds. But at no point should one range be so much louder than another that it makes it difficult to hear another range. Balance is of the essence, yet there must also be place for individual character - the unique possibility of the specific rank being voiced, to prevent the stop from becoming a boring repetition of previously crafted stops of its kind.

A pipe has to speak well, that is in balance with itself. It must neither be too quick or too slow in speech, too articulate or not articulate enough, that is, imprecise in the attack. This is one of the many challenges for a voicer. The pipes must work in and of themselves – and in balance with the rest of the stop, the rest of the division, and the rest of the organ. And all of this has to balance into the acoustic of the room, which varies somewhat according to the exact placement of the listener.

Another aspect of balance is in regard to the musical effect, in relation to the use of the organ in performance. One must consider the history of compositions over at least 400 years, and how the stop would be expected to function in that literature. But at the same time one should not be bound by a rigid, over-simplified expectation. One must create a beautiful sound that will communicate to the thousands of people who will hear it over the coming decades. It must faithfully serve the repertoire, the historical precedent, and yet be a fresh and new experience for tomorrow's performers and listeners into the coming decades. A tone must appeal to many, yet uphold the ideals of organbuilding, and prepare a new experience for the future. Unique enough effects may become the inspiration for new compositions. An outstanding example is the French Romantic style of organbuilding achieved by Aristide Cavaillé-Coll. The innovations from his firm resulted in an entire new genre of symphonic organ compositions and style of improvisation, which continues to this day.

Movement between the organ and the listener is an important aspect of balance. The stop must project well into the space, so that it has a lively, energetic effect, engaging the acoustic and making the most of its interaction with the room. At the same time it must not be too strong or aggressive. A comparison could be a person who is self-confident and effective, but still knows how to interact politely with those around.

The voicer may ask, "What is the soul gesture of this set of pipes? What does this stop want to present to the world? What expression from this set of pipes will optimize their potential?" Both identity and history are ideals to consider. The pipe should speak in a way that is reasonable for its present form, and honors the past ideals; yet it must speak strongly and accomplish something new and interesting, not just copy its predecessors. Otherwise it is like a person who just follows rules for living, but who

cannot adjust to the needs of a new situation. One of the most important aspects, is to play into the unique acoustic it lives in. The whole organ must have the objective of filling the acoustic with beautiful music, and each part, each pipe, fulfills its role in achieving that effect. From the highest pitches of a mixture to the lowest tones coming from a 16' or 32' stop, the entire organ needs the potential to engage the heights and depths of human hearing perception, and hold the maximum potential for musical expression in performance.

An organ should have the potential of speaking to the most inward, intimate human feelings, or the most extroverted, joyous emotions. As individual stops, there needs to be an individual expression with its own unique effect. But as individual pipes this is not so, rather each must contribute to the effect of the whole. That notwithstanding, the different ranges can very well carry rather different yet cohesive effects. This has to be done in a smooth, connected way so that there is binding continuity between ranges within the stop. Yet throughout the stop, there needs to be a balanced effect.

Stage 4 Intuition or Becoming One with. These words of Isis Brook sum up the fourth stage: "Here we experience the 'what it is' of the phenomenon in its full power and potentiality." ³ This stage is normally reached only after a number of years of research and practical work. The voicer gains a multitude of experiences by listening to historical examples, attempting to hear the very best that have been created. Upon this is built a study of practical specifications. Together with hearing examples and technical study, there is the experience of learning to use tools well, and practicing the art of tonal finishing a particular type of stop numerous times. It is reached when the understanding is so deep that one really knows the essence of what has been created beforehand, and is able to achieve that ideal in any particular instance. Such a voicer is attuned to the unique artistic possibilities of the specific situation, simultaneously creating a model that melds with the historical precedent, offers a musically exquisite color for performance, and a tone that can serve as inspiration for future organs and new compositions.

This is the ultimate professional goal of voicers. At this point the image carried in her/his mind should align with the archetypal ideal of the stop that is being voiced.

There should be no difference between his/her mental concept and the historical ideal. Often, though not always, by this point there will be public recognition of the voicer's mastery of the art. Two outstanding moments come to mind, from my own experience. At the end of an inaugural concert for C.B. Fisk Opus 120 in the Cathedral of Lausanne, Switzerland, a man highly recognized on both sides of the Atlantic for his expertise - who acted both as tonal director for one of the world's most prominent organ companies, and consultant for many of the largest and finest instruments in France – declared enthusiastically afterward, "This is the most exciting organ in Europe!" On another occasion, upon hearing a solo flute stop, another highly skilled voicer, someone knowledgeable from hearing in person many of the very best historical examples of that sort, felt moved to call it "the most beautiful harmonic flute in the world."

As Intuition is achieved, what has been produced as a masterpiece will offer both the organist playing literature or improvising using the tones, and the listener, a unique experience that makes the music come alive, speaks eloquently, conjuring up experiences that may be different and more satisfying than ever before.

A good instrument, played well, can profoundly heal a troubled soul. A dramatic story illustrating this once was told to me unexpectedly, when my family had a guest for supper. The conversation touched on my involvement in the voicing work at the Cathedral of Lausanne, and the visitor exclaimed "Lausanne!" Then she told us that her daughter had recently attended a short organ recital there on Pentecost (very likely hearing the very same piece heard at the beginning of this article). Her daughter's reaction, as she described it:

"I had lost my job, and I was in total despair over my future. So I decided to go and sit peacefully for a while in the cathedral. Instead there was a recital, mostly Bach, on the organ. As I heard the beautiful music played on those majestic, uplifting sounds, my soul was healed. At the end of the concert, I knew what I was going to do with my life. I had met God."

This one example – and there are undoubtedly hundreds that one never hears about - shows how the beauty an organbuilder creates can profoundly affect peoples' lives in ways we often do not know. Such musicality speaks directly to the soul, and can offer comfort, or joy, or inspiration, or healing, depending on the sounds being used, the quality of the playing, and the receptiveness of the listener.

What Rudolf Steiner said, though speaking in general about music, certainly applies to the profound effect of a good pipe organ: "The musician hears the pulse of the divine will that flows through the world; he hears how this will expresses itself in tones... Since music flows nearer the heart of the world and is a direct expression of its surging and swelling, it also directly affects the human soul. It streams into the soul like the divine in its different forms. Hence, it is understandable that the effects of music on the human soul are so direct, so powerful, so elemental."⁵

In pipe organ tonal finishing, what Steiner describes is the goal one wants to achieve: an expression of the divine on earth. Employing the Goethean Scientific Method can serve as a useful and thoughtful means to that end.

Sources:

- ¹ Letters Upon the Aesthetic Education of Man (XV), Friedrich von Schiller
- ² Innovative methods for the sound design of organ pipes, thesis by Péter Rucz, 2016
- ³ Goethean Science as a Way to Read Landscape, article by Isis Brook, 1998
- ⁴ "Zarte Empirie": Goethean Science as a Way of Knowing, article by Daniel C. Wahl
- ⁵ The Inner Nature of Music and the Experience of Tone, lecture by Rudolf Steiner, Berlin, 1906