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How Certain Musical Differences between the Historic Organs of Germany and France were Achieved by Differences in Construction

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IT'S A CURIOUS TURN OF FATE that brings scholarly interest in the organ to its present state. That the love of Bach's music should bring us to study antique Dutch and German organs-most of which Bach never heard--and that a still--alive tradition resting squarely on Cavaillé-Coll should indirectly, fill us with yearning for the French Classic Organ--these are quirks of musical history we can only marvel at. And that all this overlies some two centuries of English domination of New World organ practice? Curious indeed! Beneath, of course, lies one simple fact: we North Americans are musical omnivores, eclecticists. If anything sounds good--or sounded good once upon a time--we want to be able to hear it.

This year, for the first time, four organ builders from Canada and the United States are completing organs which are virtual copies of instruments built three hundred years ago in Europe. Strange that such an event occurs only now, considering that we have been barking up this tree since 1932. And yet we cannot be surprised by this if we remember that a whole continent's interest has had to be brought along, step by step, through a thousand gradations of eclecticism to the present state of academic near-purity.

I feel sure that we North Americans will never be able to abandon eclecticism entirely. It's such a fascinating game to try to make an organ do more than anybody thought it would. And I have to confess that in my

recent studies and imitatings of the two model organs that concern me in this lecture--the French Classic Organ and the North German Organ of the 17th century--I have never given up the notion that I might be led to a better understanding of how better eclectic organs might be built.

Even as late as the 17th century, three hundred years after the Blockwerk began to be broken up into separate stops, the organs of Germany and France still had many things in common. They had wooden cases that were never very deep, enclosed on all sides but the front, always with front pipes taken from the largest stops, and almost always with carved wooden fretwork to close in the spaces above and below the front pipes, thereby helping the front pipes discourage egress of the highest pitched overtones from inside the case. All had note-channel windchests, mostly of the pallet and slider type. They were tracker organs employing wooden traces, levers, squares, and rollers to connect keyboards to windchests. A bank of two or more cuneiform bellows, usually planted a short distance behind the organ, provided air to a single plenum wind duct seldom larger than a foot square in section. This single trunk, often about 20 feet long, ran from the bellows into the organ case and there divided like the branches of a tree, each branch smaller in section than the main trunk and each ending in the pallet box of a windchest.

Since the aforementioned elements comprise what one first sees upon looking into any old organ, a natural reaction is that there must be a great similarity in the tonal effect of all old organs. But, as we know, this is not really true. To discuss the differences we must begin with the cultural bases for our two models.

To be French is French and to he German is German. To be French in the late i6oos was to serve a king, to love delicacy and refinement, to prefer the exquisite in all things gentle, and in things bold to love the sounds of a highly organized military, the unmatchable vibrancy and écat of omnipotence. To be successfully French was to maintain a control, a savoir faire.

But to be a North German, in say, 1650, just after the Thirty Years War? This was to serve either a town council or local nobility, to live close to the land or close to the sea, to be Protestant. And in all things Protestant, there must have been a highly developed sense of Life's paradoxes: the loftiness of God and the nearness of God, the beauty of life at its best and the horror at its worst, the drudgery of now and the joy of the heavenly hereafter. In one glance they always seemed to see the light and the darkness intertwined. Dignity and savior faire are less important in this German

world where God, Magistrate, Burger and Bauer were all part of one well-regulated family, and the sounds they loved were those of people dancing and singing, and, in their imaginations, the dancing, singing, and-occasionally-the thundering of the heavenly hosts.

The French Classic Organ is a grande dame of greatest beauty, poise, refinement and temperament, somewhat distant and unapproachable, but capable of charming anyone in her realm. The North German Organ is a plain-faced girl in a dirndl who jumps up and asks you to dance.

Now down to the rock bottom of technical detail that reflects these character differences. Looking first at the flue chorus, it is well known that raw lead was for years the standard material for pipemaking in North Germany, whereas in France the admixture of tin to lead was adopted at an early time. Raw lead is a plain-sounding material that imparts no marked overtone structure to the tone of a pipe, whereas tin adds a sheen of overtones which, under the right circumstances, produces a tone of explicit elegance. Moreover, tin imparts its sheen even when the pipes are gently blown, thus lending a special serenity and majesty to the French Plein Jeu, which tended to be less than full blown. So used, tin is thus the metal of refinement and delicacy. As for lead: if lead pipes are gently blown, they produce a tone of no particular distinction. Lead comes alive only when it is blown full. Assuming cutups that are high enough to avoid edginess, the tone of a chorus of lead pipes blown full is deceptively massive, with resultant tones that give a marked solidity to the fundamental. There is a faint halo of overtones that imparts a human or naturalistic flavor. Perhaps the most wonderful characteristic of lead pipes, both principals and flutes, is the agility they seem to give an organ lead pipes reach their note so quickly, firmly, and gracefully that they will clearly delineate even a disjunct sixteenth- note figure in the lower register. Lead pipes and the' type of voicing they encourage are largely responsible for the open-faced "let's dance" quality that is so much a part of the North German Organ. The face of lead is the face of the girl in the dirndl; but the tone of lead is dark--much darker, incidentally, than the thin tone of the modern Neo-Baroque organs, most of which disregard totally the essential paradox of the North German Baroque, the paradox so often expressed iii the old case pipes of black lead trimmed in filaments of gold, again: the paradox of darkness versus light.

The difference of character between things French and German is nowhere more evident than in the reed stops, and especially in the treatment of the organ trumpet stops.

Organ reed pipes consist of two parts, the motor and the resonator. The motor, which contains the block shallot, tongue, and tuning wire, corresponds to the mouthpiece and embouchure of an orchestral wind instrument, while the resonator corresponds-to the "horn" -held in the player's hands. If you ask a wind player to detach the mouthpiece from his instrument and blow through it, the results are squawks, squeaks, and buzzing--the raw stuff from which wind instrument sound is always made. In an organ reed pipe, detaching the resonator from the motor produces similar noises, except that the buzzes sound more metallic, owing to the vibrating parts being made of brass instead of cane or human flesh. Quite evidently, in wind instruments the resonator's job is to render harmonious the raw sound energy produced by the motor, but this is a job of varying difficulty depending on the relative roughness or smoothness of the motor's output. Indeed, the tremendous variety of tone possible in organ trumpet stops is largely owing to different designs of motor, especially since the resonator always has the same shape, namely that of an inverted cone.

The critical elements of the motor are the curved brass tongue and the shallot against which it is made to beat by the force of the surrounding air. Trumpet pipes from the Renaissance employed a thin tongue and a single wide-open brass shallot with a very narrow rim for the tongue to beat against. The throat, i.e., the upper end of the shallot through which the air passes on into the resonator, was generous. The tone of pipes made in this way is loud, brilliant and rather metallic, especially in the bass. Indeed, there is a marked tendency for the bass of such a trumpet to drown out its own treble. Wide-open Renaissance shallots produce such a blaze of overtones in bass pipes that the darker and thinner sounding treble pipes merely seem to become part of the bass pipe structure and have no melodic life of their own. Such a trumpet is, of course, ideal for lining out a cantus firmus in the tenor or bass, and it is thrilling in chords and fanfares. But taken by itself, the Renaissance Trumpet is of little use in complex polyphony.

Historically, a great deal of thought has gone into devising ways of getting around the tendency of the trumpet bass to dominate the trumpet treble. For the orchestral trumpeter, too, this would be a problem were it not for his ability to apply much greater air pressure for his high notes than for his low notes. Indeed, the 19th century organ builder, Cavaillé-Coll, chose precisely this orchestral solution: he simply placed his treble pipes on higher chest pressure than his bass pipes. Other solutions exist, as we shall see.

A second problem area for organ trumpet stops centers around the combining of trumpets with choruses of flue pipes. Reeds and flues produce their tones according to two totally different physical principles, so perhaps we should only marvel that they can be used in combination at all. The crucial difference lies in the attack: flue pipes--even those with a transient chiff--begin their notes relatively gently and on time; the trumpet, however, begins its notes explosively, and often a bit "late," depending on the amount of tongue curvature. The initial explosion is occasioned, of course, by the inrushing air which slams the tongue shut flat against the shallot, much as a gust of wind will slam a door in an open house in summer. This first stroke of the tongue is followed by others, and there ensues a short period of musically important confusion, during which the resonator, so to speak, wakes up and realizes that it must rouse itself and join the tongue in its jubilations. The vibrations heard during the period of confusion constitute the reed pipe's version of the chiff--its signature. Signature is a useful word here because every reed pipe has its own unique way of beginning its note, a pattern of vibrations unlike those of any other reed pipe. The signatures of pipes of the Renaissance Trumpet family are the "John Hancocks" of the organ world. Brassy, effusive, spectacular, they rivet the attention. The horizontal trumpets of Spain and Portugal are the best remaining examples of the Renaissance Trumpet; by their appearance and their clattering, they unmistakably suggest the many-tiered guns of a Spanish galleon. There is an "all-out" quality here that cannot be matched by flue work of any kind.

French bon goût did not allow the French Classic Organ to retain quite the all-out quality so loved by the Spaniards; nevertheless, the French let the assembled trumpets take the responsibility for creating the French Classic Organ's most formidable effect, the Grand Jeu. Further, to make the treble line heard above the trumpet basses, they added the Cornet de dessus, a compound stop of five flue ranks (including the tierce) voiced and scaled to expand markedly in power as it approached the treble. And the French Trumpet is essentially the Renaissance Trumpet, somewhat refined by scaling down the shallots and resonator tips, and by never allowing it outside the organ case. Hammered tin was used for the trumpet resonators to intensify the overtones, and thin tongues beating against thin-rimmed shallots gave to the whole array the signatures of splendor and éclat. When the trumpets are drawn in a French organ it is as though the organ has become angry. But dignity, breadth, equanimity, serenity, pathos--these are mainly provinces of the fluework which is always held back to an extent in its winding as if to avoid encroaching on the territory of the trumpets.

Cor Edskes says that about 1 5 50 the Scherers of Hamburg adopted a new

form of bass shallot representing a total departure from the simple shallot of the Renaissance. The habit of using these new shallots for trumpet basses, and for all reed basses except those of the regals, rapidly took over in the coastal areas of Germany and the Netherlands, where their use has never been completely discontinued. These shallots have wide bores and correspondingly wide tongues, but between the tongue and the shallot opening is soldered a heavy lead plate--in effect, a cover for the shallot opening. The center of this lead plate is pierced with an elongated hole occupying about one-third of the plate area; through this hole the air flows into the shallot and thence into the resonator. In Schnitger's organs the lead plate is usually surfaced with leather; earlier builders were ambivalent about the use of leather for the shallot surface.

An obvious function of the lead plate is to limit the flow of sound energy passing through the shallot. Because the plate is made of lead, it is easy with a knife to enlarge the elongated hole; this gives the voicer control of the amount of sound energy passing into the resonator, and therefore the opportunity to: adjust the loudness of the bass pipes relative to the treble pipes, which have no lead plate. Moreover, the effect of cutting down the energy of the bass pipes by limiting the hole size also diminishes overtones and makes the steady-state tone not only gentle but muffled, rather like the tone of an orchestral French Horn. This is a far cry from the splashy trumpet of the Renaissance, but it is a trumpet which blends very nicely with the flue chorus.

A second and equally important function of the lead plate is to speed up and intensify the attack. Consider the shallot and tongue in the rest position: the tongue is poised close above the lead plate. When air is suddenly admitted to the system, its only escape is through the elongated hole and into the shallot,' but its path takes it through the - narrow zone between' the tongue and the unpierced portion of the lead plate. In such a narrows, the air velocity rises, and where velocity rises, pressure drops, as we know by Bernouilli's principle-the famous principle that accounts for the lift of an 'airplane wing. The combination of the energizing positive pressure above and Bernouilli's negative pressure (suction) beneath the tongue causes it to slam shut with much more force than would be the case without the lead plate. Trumpet basses using these shallots actually speak more quickly than flue basses of the same pitch and are thus ideal for assisting the flue choruses in rapid passage work. Indeed, in an organ with pedal towers mounted on the gallery railing, as at the Cosmaekirche in Stade, the effect of the pedal trumpets is positively percussive: a rapid pedal trill in a low register produces the illusion of two tuned drums being beaten in oscillatory fashion. That the brass tongues are broad and thick,

and that they beat against a heavy lead plate covered with animal skin, undoubtedly contributes to this illusion, as does the fact that the slamming of tongue against shallot telegraphs throughout the organ framework and the entire balcony structure.

One cannot talk about the reeds in a German organ without mentioning their influence on other pipes via the note channel, the tunnel-like chamber in the windchest which fills with air when the key corresponding to it is depressed and which, in turn, feeds air to all the pipes on the chest that correspond to the key.

Now it is well known that any sounding organ pipe sends a portion of its sound energy back through its own foot into the note channel. When several pipes over the same note channel are sounding, the aggregate of their sound within the note channel can be very intense. This is especially true when reed pipes are sounding. One strong reed pipe can set up vibrations in a note channel that will compel all the flue pipes on the channel to "fall into line," i.e., to synchronize their pitches with harmonics of the teed. Furthermore, if the reed pipe is of low pitch relative to its channel-neighbor flue pipes, for example a sixteen-foot Pedal Posaune speaking on the same channel with a mixture--each small flue pipe will "flutter" or warble in sympathy with the flapping of the Posaune's tongue, and in so doing will become secondary sources of the Posaune's tonal output. Indeed, even though the Posaune produces, out of its own resonator, a smooth, foundational sound, the fluttering heard in the flue chorus belies this smoothness; instead, the fluttering seems to comprise mainly upper harmonics in the Posaune that would pass unnoticed if the Posaune were sounding alone. In this way the Posaune's natural darkness is embroidered with a light of its own making, thanks to the intermediation of the flue work.

The North German Trumpet may have had the steady-state tone of a muffled horn and the signature of a muffled drum, but it could set the flue work ablaze. In fact, the sound of flues and reeds drawn together in a big German organ has some of the angry quality of the French Grand jeu, due largely to the reeds' acting upon the upper work via the note channels.

Ah, the note channel-what mysteries lie hidden in that small medieval tunnel! Organ sound is conceived in the note channel, born in the pipe. Half the troubles in an organ seem to originate in the note channel, and yet, so also do a thousand unknowable, dissertation-worthy intricacies that help make of the organ the instrument we find so irresistible.

It was German to be obsessed with the possibilities the note channel brought to the art of combining stops on the same windehest. It was French, however, to wish for a more reasonable note channel, one with fewer mysteries-and fewer problems. The classic French builders used, therefore, a note channel that leaks its sound away through a flexible leather membrane on its underside, thereby freeing each pipe to act more on its own, with less interference from its channel neighbors. Not until Cavaillé-Coll do we see in France hard-walled note channels again put to signal use: he found that by placing his choruses of Bombardes over small, tight note channels he could create those doomsday throbbings, those wondrous sounds that seem to be coming from some great buzzsaw in the sky.