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Organbuilding and Sustainability
Part I. Materials

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INTRODUCTION

The sound of an organ pipe is a combination of several factors: the shape of the pipe, the wind pressure, the cut up, various voicing aspects, and the material used. While the hierarchy of these factors is debatable, the importance of the material on pipe's tone is significantly less than with other instruments. Special woods are used for instruments such as clarinets and guitars because their resonance properties provide the instrument's characteristic sound. Unfortunately, the increasing demands placed on these resources is causing their managed protection by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), an organization charged with ensuring the protection of the earth's resources.[1] Instrumental manufactures are now rapidly exploring alternatives.

The organ does not require the use of tone woods, meaning deforestation trends have not demanded changes from builders. However, the use of lead came under attack in 2006 when the European Commission sought to ban its use from all electronic devices;[2] the use of electrical components, such as wind blowers, initially categorized the organ under this legislation, including pipework. While the organ has narrowly escaped, being added as an exception to the rule,[3] many European builders moved away from using lead in soldering electrical components.[4]

In the next installment of this article, conversations with organbuilders will analyze current trends and prevailing attitudes toward sustainability. This first part provides insight into *why* various materials are used in organbuilding and challenges the importance placed on the auditory aspect of the materials. There are no better resources with which to begin than historical organbuilding treatises.

ORGANBUILDING TREATISES

In his monumental *L'Art du facteur d'orgues*, Dom Bédos de Celles commented on the plethora of materials used in organbuilding from the beginning: gold, silver, copper, bronze, brass, alabaster, glass, and even pipes made of playing cards![5] Before one uses playing cards for the next 8′ Bourdon, he clarified that "it would seem that these materials were used only for curiosity and oddity, without claiming that they were better suited to this purpose."[6] In addition, Poul-Gerhard Andersen mentioned the use of glass, stiff cardboard, and porcelain in his 1969 book.[7]

In regards to the various types of wood used in organbuilding, Audsley's *The Art of Organ-Building*, published in 1905, is the most comprehensive, providing great detail on the variety of woods available, including pine, spruce, poplar, oak, maple, mahogany, black walnut, and even teak. Audsley recommended oak as the best, but suggested any wood is suitable, so long as it is free of general blemishes.[8] Hop-

1. "How CITES Works," CITES organization, accessed September 23, 2013, http://cites.org/eng/disc/how.php.

2. Alan Cowell, "Europe Declares Pipe Organs Health Hazards," *New York Times* (March 22, 2006): A8.

3. David Hemsley, "The BIOS column: British organ-builders lead Europe," *The Organ* 85 (August 2006): 62.

4. Correspondence with Didier Grassin of Noack Pipe Organs, September 22, 2013.

5. François Bédos de Celles, *The Organ-Builder,* trans. Charles Ferguson (Raleigh: The Sunbury Press, 1977), xxxiii.

6. Ibid.

7. Poul-Gerhard Andersen, *Organ Building and Design*, trans. Joanne Curnutt (New York: Oxford University Press, 1969), 35.

8. George Ashdown Audsley, *The Art of Organ-Building* (New York: Dodd, Mead & Co., 1905; Dover Publications, 1965), 431.

kins and Rimbault confirm this in *The Organ* when discussing the English builder, Father Smith, who would "never use any [wood] that had the least flaw or knot in it."[9] Further, they noted mahogany's stability for instruments in hot climates, and mentioned regular use of cedar, deal, pine, and oak.[10]

Organbuilders frequently discuss the significance of certain metals, particularly lead, tin, and zinc, as opposed to the various woods used in organs. Since the use of lead is currently in question, Arnolt Schlick's thoughts are particularly germane: "Lead is not as long lasting or durable as tin, for lead easily oxidizes from dampness, and holes appear in it from decay. . . . For these and other reasons, lead, in its pure state, is not suitable to be used for pipes. . . . Some [builders] mix together half tin and half lead, less or more as seems good to each. But it seems to me that the less lead and the more tin, or pure and all tin, is much better and more enduring."[11]

For Hopkins as well, tin was "first in point of excellence . . . for organ pipes by its great durability, its superior silver colour, and its lightness."[12] He praised tin for its sturdy intonation, but noted that its low melting point of 442°F requires at least a small portion of lead, melting at 612°F, to aid in the workability of the resulting alloy.[13] John W. Hinton further argued for an alloy of both materials: "there is no such thing as 'pure tin' in use; nearly ten percent of lead *must* be mixed with tin to render it workable."[14]

TONAL PROPERTIES OF METAL

The perceived auditory properties of lead can be traced back to Schlick, who was perhaps the first to argue that lead pipes were "sweeter sounding than those of tin."[15] Many builders believe this today. In 1987, Charles Fisk described lead pipes as having "a darkness, a hollowness, a sound as of deepest antiquity [and] a strength of sound."[16] He believed that tin pipes embodied the "sound of refinement" as "tin loves to produce overtones."[17]

Hinton wrote that "zinc, while possessing some special advantages for fronts—in being less susceptible to injuries, and cheaper—never gives a really *round* and musical tone."[18] Bernard Sonnaillon also claimed zinc to be "a metal whose tonal virtues are less than evident."[19] Andersen vehemently disagreed with this perception, claiming that pipe material had no influence on the tonal quality:

> It is a common misunderstanding that the material of pipes, metal or wood, determines the quality of the sound, and that this material even creates the vibrations, like a string or a bell. This is not true. The tone is produced by the air column which is confined in the body of the pipe, and the sole function of the pipe walls is to enclose the air column and provide it with the correct dimensions.[20]

Further, he argued the shape of the pipe (e.g. cylindrical, square, chimney shaped) had a far greater significance on the tonal quality than whether the pipe was made of metal or wood.[21] Before Andersen is dismissed too quickly, there is scientific backing for his beliefs. In 1965, after extensive analysis of various materials, John Backus and T.C. Hundley argued the following:

> The steady tone of a pipe does not depend on the material of the pipe wall. The belief that the use of tin in constructing pipes gives a better tone appears to be a myth unsupported by the evidence. The main reason for the use of the usual tin-lead mixtures would seem to be the practical one of ease of working and pipe voicing. There is also a psychological factor; tin is expensive, and it is natural to think of a more costly pipe as producing better tone.[22]

In citing previous work, Backus and Hundley noted the experiment completed in 1940 by Boner and Newman, in which various metals, a wooden cylindrical pipe, and a pipe made of wrapping paper were compared: "listening tests made on these pipes showed very small audible difference."[23]

CONCLUSION

Organbuilders have always been concerned with cost and this should not be overlooked when analyzing why certain materials are used. Hopkins and Rimbault noted tin to be upwards of six times as expensive as lead;[24] centuries earlier, Schlick claimed the use of lead on the hintersatz was because of the lower cost.[25] Perhaps, the increased cost of tin in the 1970s,

9. Edward J. Hopkins, Edward F. Rimbault, *The Organ, Its History and Construction* (London: R. Cocks, 1855; reprint Hilversum, Holland: Frits Knuf, 1965), 100.

10. Ibid., 100.

11. Arnolt Schlick, *Spiegel der Orgelmacher und Organisten* (Mainz, 1511), trans. Elizabeth Berry Barber (Buren, the Netherlands: Frits Knuf, 1980), 55.

12. Hopkins, 96.

13. Ibid., 97.

14. John William Hinton, *Modern Organ Construction : A Course of Three Lectures Delivered on April 22nd, 24th, and 26th, 1901* (London: C. Jacques & Son, 1901); reprinted as *Organ Construction* (Buren, The Netherlands: F. Knuf, 1992), 68.

15. Schlick, 55.

16. Charles Fisk, "Some Thoughts on Pipe Metal," *The American Organist* 21, no. 4 (April 1987): 73.

17. Ibid., 73.

18. Hinton, 11.

19. Bernard Sonnaillon, *King of Instruments: A History of the Organ,* trans. Steward Spencer (New York: Rizzoli, 1985), 28.

20. Andersen, 35.

21. Ibid., 26.

22. John Backus and T.C. Hundley, "Wall Vibrations in Organ Pipes and Their Effect on the Steady State Tone Quality," *The Journal of the Acoustical Society of America* 39 (December 1965): 945.

23. Ibid., 937.

24. Hopkins and Rimbault, 97.

25. Schlick, 55.

from $3 a pound to $6 a pound in a span of five years,[26] contributed to zinc's popularity. In fact, Fisk argued the exact combination used for spotted metal has as much as anything to do with financial reasons.[27]

Compromise is always necessary with any organ contract. Those seeking to commission an organ are always struggling to make best use of the resources available. Building an instrument with a desired stoplist within a set budget requires creativity on the part of the builder, and often this affects the materials used. Andersen, reiterating the minimal influence on the sound of the pipe material, stressed the importance of practicality: "consideration [of pipe material] must also be given to purely practical matters such as manufacture, stability and price; and just because the air column in the pipe and not the pipe wall is the sound-producing element, practical considerations will often have a decisive influence on the choice of the pipe materials."[28]

If the material does not matter, and with natural resources dwindling, there has never been a better time to explore alternative resources for organbuilding. In the next installment, we will explore current trends among American organbuilders and prevailing attitudes towards sustainability.

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For additional information, including several audio links, please visit www.jonathangregoire.com.

26. Fisk, 73.

27. Ibid.

28. Andersen, 35.

Articles of Interest

from Organ and Other Journals Around the World

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