The Ancient Art & Science of Violinmaking

Outline

I. Violin as the perfect invention

II. Development in Cremona, Italy (17th C.)
   - external toolmarks

III. Modern Research – Improving the Violin

IV. Modal analysis

V. The complications of the human brain
   - auditory shape recognition
   - hearing hot vs. cold water
   - reassembly of tones

VI. Acoustic Reproduction of Violin Sound
   - radiation field

VII. New Developments

-Oded Kishony, UVa Physics Colloquium, Sept 2008
Early medical tool as compared to early violin
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12th century

15th Century

Modern (left)

Baroque 15th-16th C.(right)
The shape of the F hole is critical to sound production
Daily Progress Slideshow
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    - computer helps us ‘hear’

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Song of a Winter Wren

Same song at 1/5th speed

Recording from “The Singing Life of Birds” by Donald Kroodsma
Photo: Lloyd Spitalnik http://www.pbase.com/btblue/image/51741379
Ernst Chladni
1756 - 1827

Computers + Modal Theory
= Modal Analysis

Oberlin Experts: Bissinger, Davis, & Stoppani

Carleen Hutchins & Taptones

Lord Rayleigh
1842-1919

Martin Schleske
Computer helps us ‘see’

XJackson Strad F holes in motion

Thanks to William Sloan
And George Stoppani
Scientific plate tuning – Chladni pattern modes of a free violin plate

Carleen Hutchins and the “Scientific School” of violin making
Adjust thicknesses and arching of plates to give modes
an octave apart and symmetric mode shapes

1st three modes of an isotropic, square thin plate
Figure 1 – Envelopes for Dünnwald overlays of 10 old-Italian, 10 master, and 10 factory violins’ acoustic outputs up to ~7 kHz [2]. The major radiating signature modes A0 (lowest cavity mode near 280 Hz) and the 1st corpus bending modes B1− and B1+ are labeled. Note regularity of A0, B1− and B1+ envelope for the old-Italian violins, but not for other classes.
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   Computer helps us ‘see vibrations’

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Schleske

Schleske 2
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Balsa violin Dough Martin 2008
David Rivinius  “Pellegrina” ergonomic Viola
The End