CT Scan Cross-Profiles through Cremonese Stringed Instruments

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ABSTRACT

A series of cross profiles are shown for famous Cremonese violins and violas by Nicolò Amati, Andrea Guarneri, and Nicola Bergonzi. These show in detail how the thickness of the plates interacts with the curves of the inside and outside arching, which is part of the information needed by makers to produce accurate copies of great instruments.

INTRODUCTION

X-ray computerized transaxial tomographic (CT) scanning is an important tool for studying classic violin family instruments [1]. The technique is especially valuable for obtaining accurate measurements of thickness, and for understanding how thickness relates to subtle changes in the shapes of curves of the inside and outside arching. Such data are of great interest to makers, although CT scans have rarely been tailored for this purpose.

We present a series of slices through Cremonese violins and violas that are part of the collection at the National Music Museum, in Vermillion, South Dakota. The slices chosen correspond to the "quinta" of arching profiles often used by makers to set their top and back arching curves. These are positioned at the widest part of the upper bouts, the upper corners, the narrowest part of the middle bouts, the lower corners, and the widest part of the lower bouts. Thickness graduation maps (contour interval 0.25 mm) are made based on point measurements from a magnetic thickness gauge, contoured using a geographic information system. We also include a variety of photos of several of the instruments.

These images offer a taste of a multitude of new data (CT scans, thickness maps, photos) that have recently been generated on fine instruments. There is great potential for additional products, and we welcome specific suggestions regarding useful formats that will better help makers to emulate old master instruments.

REFERENCES

[1] Waddle, J.R., and Sirr, S.A., 1996, X-Ray computerized transaxial tomographic analysis of stringed instruments: Catgut Acoustical Society Journal, vol 3., no. 2 (Series II), p. 3-8.

Figure 1. Photos and thickness graduation maps of violin by Nicolò Amati, 1628, Cremona. Thickness is given in millimeters (0.25 mm contour interval). Dimensions: Body 352 mm, Upper bouts 165.5 mm, Middle bouts 106.5 mm, Lower bouts 205 mm, Arching: top 18.0 mm, back 16.7 mm; ff-hole spacing 36.5 mm, Rib thickness 0.9-1.05 mm, Weight 381 g. Horizontal lines show approximate positions of CT scan cross-profiles shown in Figure 2.

Figure 2. CT scans of violin by Nicolò Amati, 1628, Cremona

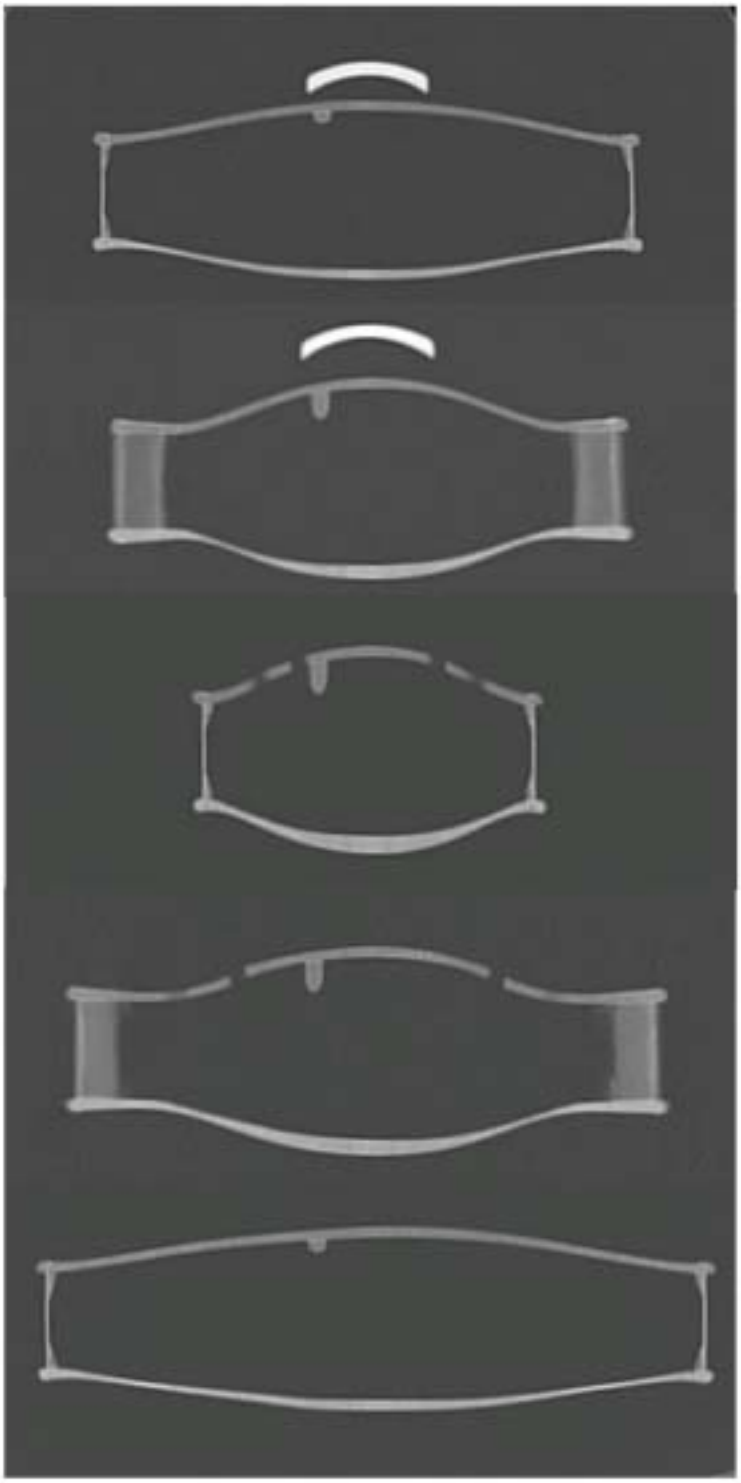

Figure 3. Photos and thickness graduation maps of tenor viola by Andrea Guarneri, 1664, Cremona. Thickness is given in millimeters (0.25 mm contour interval). Dimensions: Body 482 mm, Upper bouts 242.0 mm, Middle bouts 166.6 mm, Lower bouts 280.4 mm, Arching: top 22 mm, back, 20.5 mm, ff-hole spacing 60 mm, Rib height 40.5-44.5 mm, Weight 829 g. Horizontal lines show approximate positions of CT scan cross-profiles shown in Figure 4.

Figure 4. CT scans and side view (right) of tenor viola, Andrea Guarneri, 1664, Cremona.

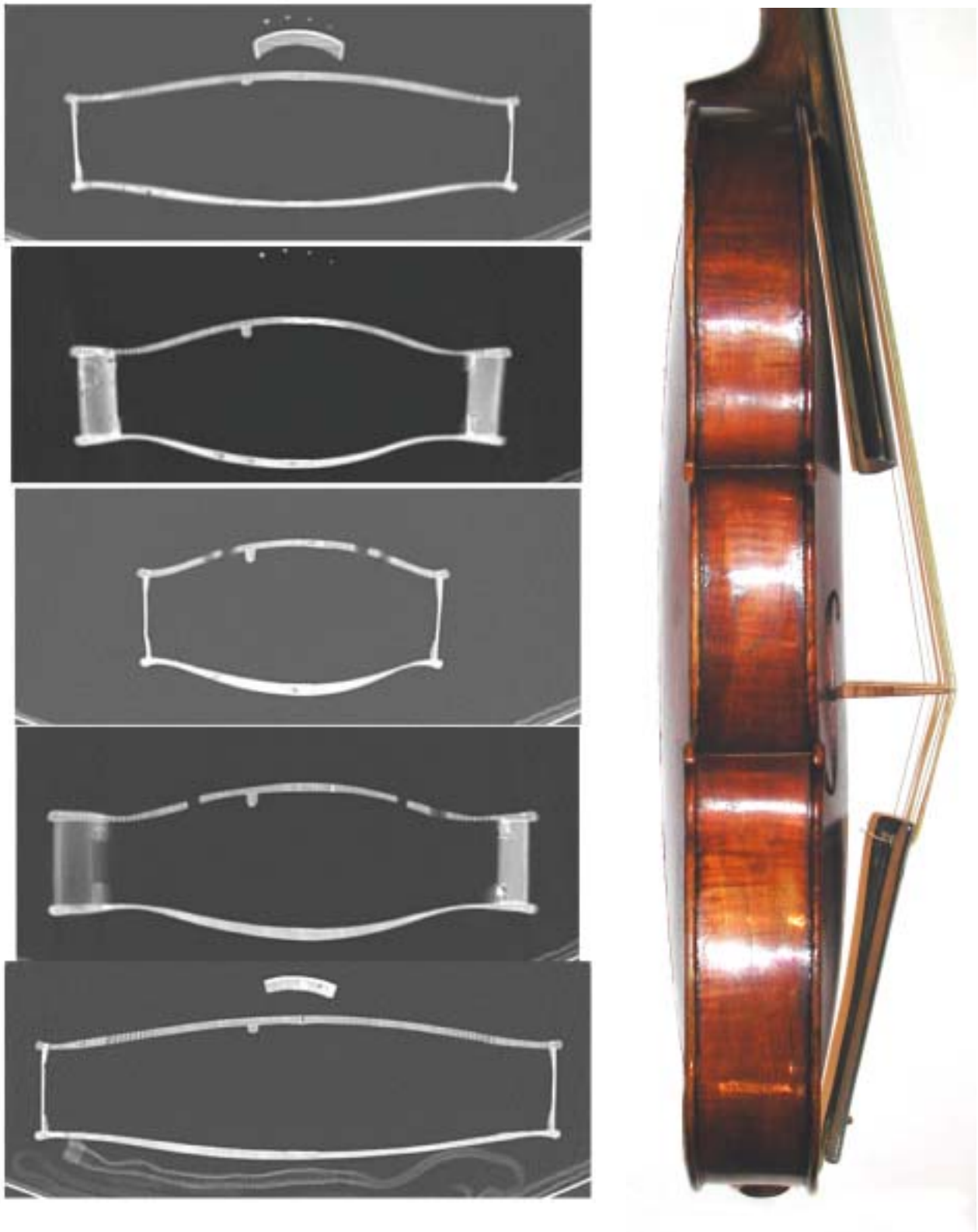

Figure 5. Photos and thickness graduation maps of viola by Nicola Bergonzi, 1781, Cremona. Thickness is given in millimeters (0.25 mm contour interval). Dimensions: Body 410 mm, Upper bouts 196.2 mm, Middle bouts 133.1 mm, Lower bouts 238.9 mm, Arching: top 18.2 mm, back 21.9 mm, ff-hole spacing 61.8 mm, Rib height 31.1-32.8 mm, Rib thickness 0.9-1.2 mm, Weight 561 g. Horizontal lines show approximate positions of CT scan cross-profiles shown in Figure 6.

Figure 6. CT scans and side view (right) of viola by Nicola Bergonzi, 1781, Cremona.