

The Art and Craft of Saxophone Mouthpiece Design

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CONNECTIONS

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BACKGROUND

MOTIVATION



One of our vintage mouthpieces.

Traditional measurement techniques do not preserve the detail necessary for a true vintage mouthpiece replica.

- The mouthpiece is the most important acoustic component of a saxophone.
- Vintage saxophone mouthpieces from the era 1930-1968 are extremely desirable yet increasingly rare.
- Even the best-regarded reproductions fall short of vintage pieces.

GOALS

Create a Mouthpiece Archive: Produce 3D models of three rare jazz mouthpieces from 1930-1968 using microCT scanning.

Relate Sound Quality to Physical Features: Record tones on vintage mouthpieces to investigate the link between physical and auditory characteristics of mouthpieces.

Reproduce High-Quality Mouthpieces: Create true copies of mouthpieces using a Formlabs 3D printer.

OUR MOUTHPIECES

We studied eleven mouthpieces, including three rare vintage pieces:



Otto Link Reso-Chamber, F.G. refacing

Produced c. 1940-1946. Highly collectible due to its rarity and the reputation of famous refacer Freddie Gregory.

Otto Link Reso-Chamber, J.A. facing

Produced c. 1940-1946. Facing curve is original Joe Allard facing from the factory, significantly different from a typical vintage jazz piece.

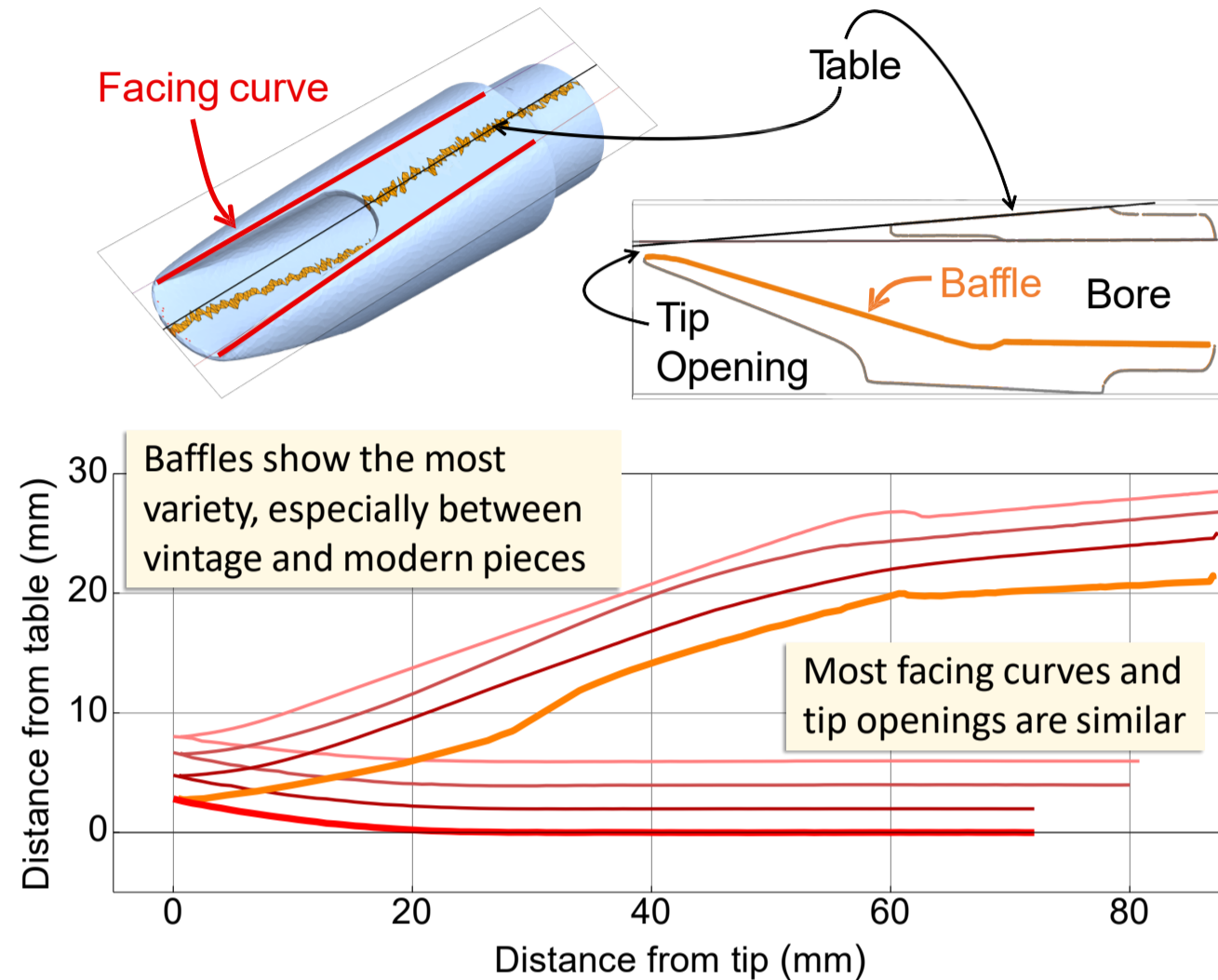
Otto Link Slant Signature, E.G. refacing

Produced c. 1950-1956. The originally small tip opening was opened up by refacer Eric Greiffenhagen. Highly desirable collectible piece.

We also had five modern vintage replicas (Jody Jazz HR Star, Vandoren V16 T8, Ted Klum Tonamax, D'Addario Select Jazz) and three modern pieces (J&D Hite Premiere, Theo Wanne Slant Signature 2, Otto Link Tone Edge)

DATA

3D SCANS FOR MECHANICAL FEATURES



RECORDING SESSIONS AND AUDIO DATA

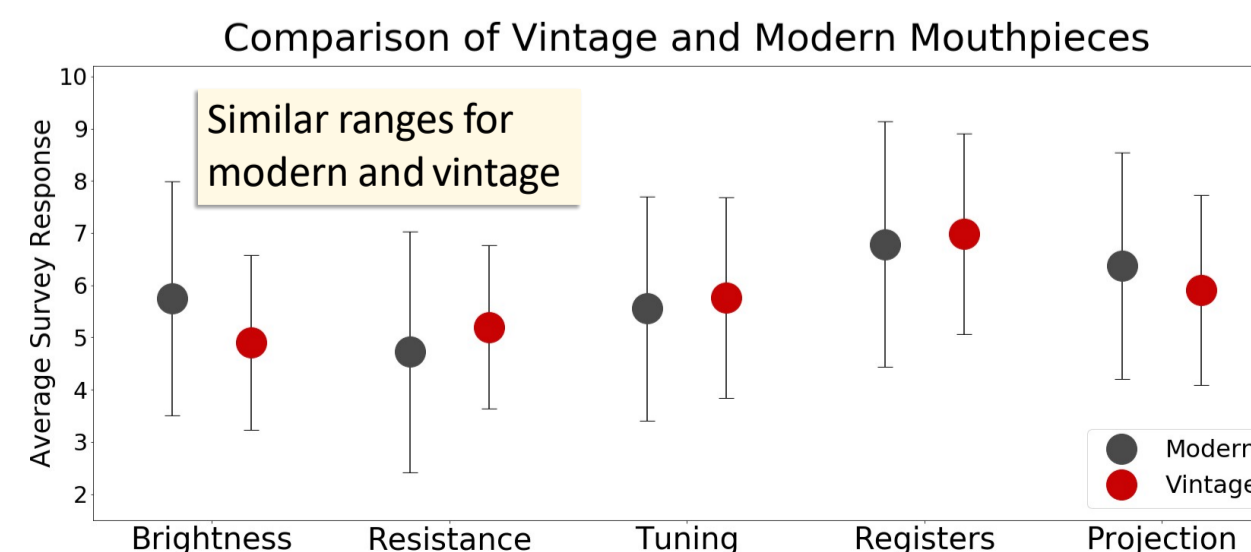


Dave Finucane at the Durham Jazz Workshop for our recording session.

We recorded eight musicians. They rated each mouthpiece on a scale of 1 to 10 for five qualities:

1. Brightness
2. Resistance
3. Tuning
4. Register Transitions
5. Projection

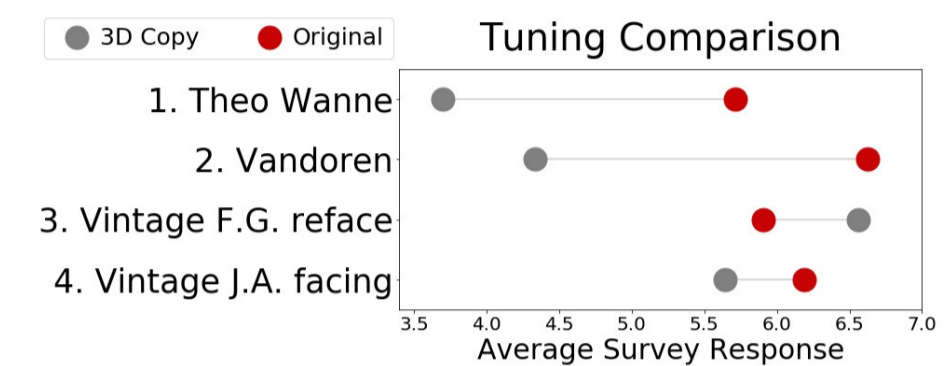
Musicians consistently rated some mouthpieces differently than others, but vintage mouthpieces were never among these outliers.



RESULTS

Learning Curve of 3D Printing Mouthpieces

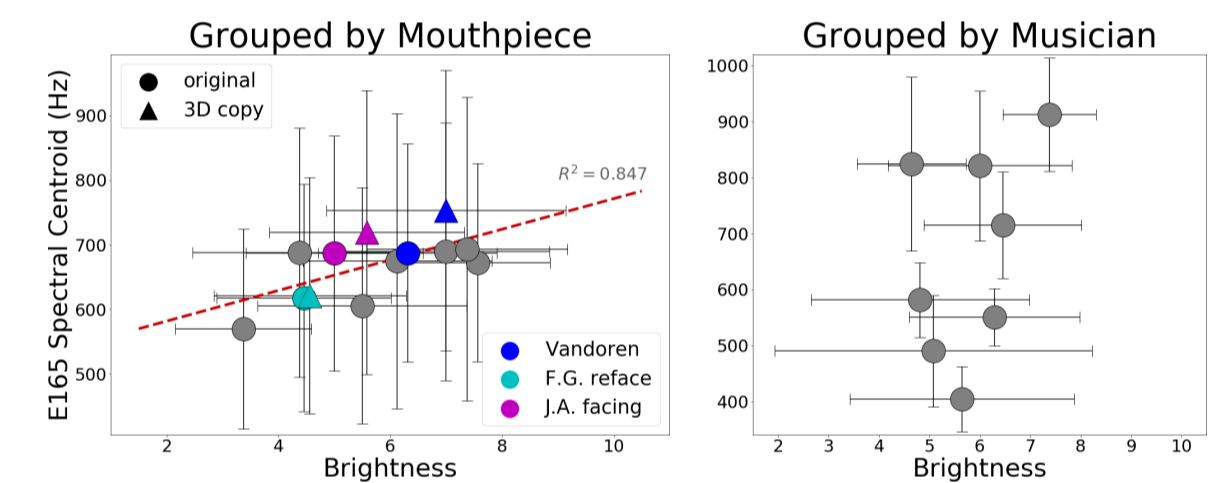
We made 3D copies for four mouthpieces. Our first copies received poor tuning scores, but the newer copies were rated like their originals.



We produced the highest quality 3D copies after our first two attempts.

Survey-Audio Data Correlation Analysis

Example: Spectral Centroid vs. Brightness



- Mouthpiece groupings show a positive correlation between musician-ranked brightness and recorded spectral centroid.
- Vintage 3D copies are more similar to their originals than modern replicas for both brightness and centroid.

Musicians Find 3D Copies Similar to Originals

- The favorite mouthpiece of most musicians was one of the vintage pieces, with some preferring the J.A. and others the F.G. reface.
- The vintage mouthpieces ranked average for their mechanical features, recorded characteristics, and survey responses.
- 3D copies had similar audio and survey data as originals, suggesting **microCT scans capture features not reflected in standard mechanical or audio metrics.**

CONCLUSIONS

We successfully created an archive of vintage saxophone mouthpieces.

We produced high-quality 3D-printed mouthpieces, including two better than current commercial options at approximating a vintage mouthpiece.