Background: Making a Violin

- The table and back of a violin are carved from wood.
- First the shape is roughly carved by eye:
- Next the shape is carefully carved and smoothed to match a series of templates known as cross-archings.

- Question: what curves should be used for cross-archings?
   In recent years, violin makers refer to books or posters that show the cross-archings of great instruments of the past.
- The question remains as to where the originators of these curves obtained them.

Cycloids

- Cycloids and similar curves have a long history of use in science engineering [1].
- A curtate cycloid is obtained by rolling a circle along a line, and tracing the path of a point on the interior of the circle, a construction that was well known in the 16th and 17th centuries.
- The formula for a curtate cycloid is

  \[ x = Rt - r \cos(t + \pi/2) \]
  \[ y = r \sin(t + \pi/2) + r, \]

  where \( R \) is the radius of the rolling circle and \( r \) is the radius of the circle containing the point whose path we are tracing.

- Empirical testing suggests that the cross-archings used in most golden-period Cremonese instruments (which include those of the Amati and Guarneri families as well as Stradivari) were curtate cycloid curves [2].

Antonio Stradivari Viola, 1696 “Archinto” Back

Catenary

- A catenary curve is obtained by dangling a string from two fixed points.

  \[ t, a \cosh(t/a) - a \]

- We are exploring the idea that the lengthwise cross section of some violins was made from catenary curves

Amati Violin, 1628

References


Acknowledgements

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