Initial transients (articulation) are important to musicians. • How do clarinettists use the tongue to start notes? • Why does the standing wave grow and why is the rise exponential? • Is the mechanical energy of the reed involved?

Tonguing styles

Materials and Method
Synchronised measurements of tongue position and reed-mouthpiece separation (1200 to 8000 frames s⁻¹), mouth pressure, pressure in instrument and at bell.

Conclusions
• After release by the tongue, the reed, over-damped by the lip, quickly comes to mechanical equilibrium, losing all its mechanical energy.
• The sudden change in aperture produces a sudden change in air flow which, from multiple reflections, builds a standing wave.
• The negative AC conductance of the reed converts DC to AC power and, when large enough to overcome the (small) losses in the bore, produces an attack that is exponential (until nonlinear terms dominate).
• Players produce different rise rates by controlling blowing pressure and lip force, which control reed conductance.
• They coordinate this with tongue release to vary the initial amplitude and attack duration.
• Players have qualitatively different tonguing styles, but can still produce similar effects.

References

* This poster includes work from Weicong Li’s PhD research, from undergraduate vacation projects of John Gray and Lauren Inwood, and earlier work by the other authors.