

Atomic Technique: The Elements of Bowing

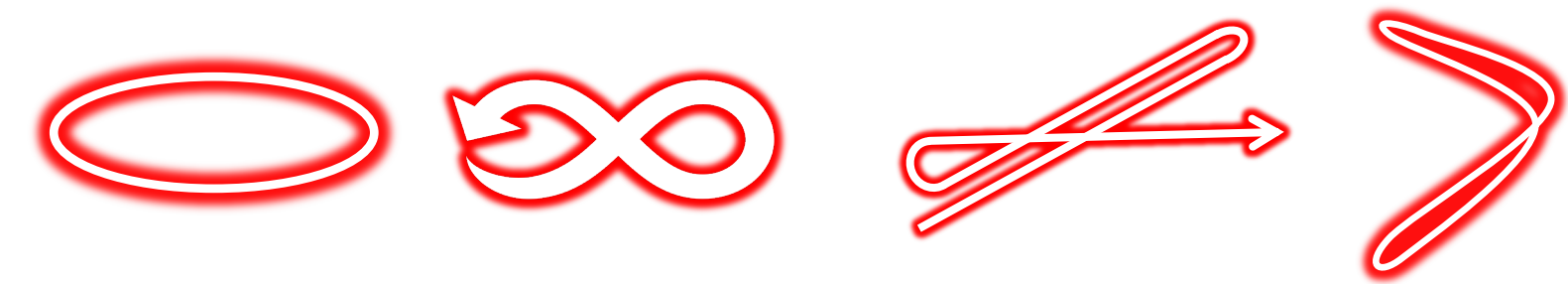
TRAJECTORY OF THE BOW

IMPULSE

- Description**
 - ◆ The collision of the bow onto the string which ignites sound
- Application**
 - ◆ overcoming vs. harnessing **Resistance**
 - ◆ 3D **Clock Directions** of preparation/ release via *dropping* vs. *lifting*
 - ◆ **Density Signature**

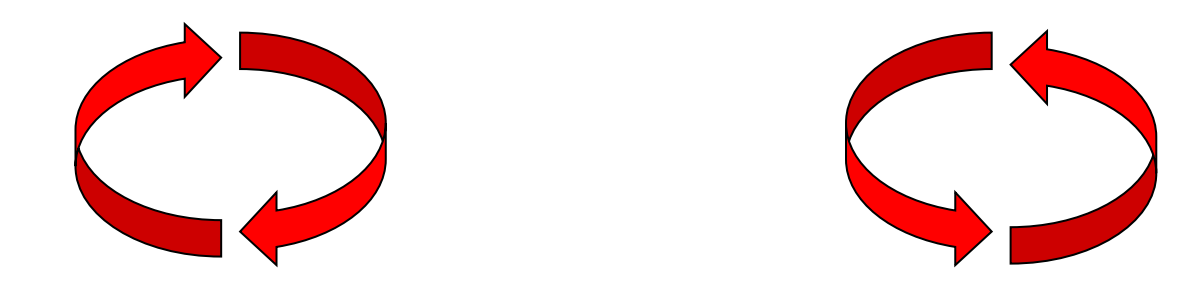
SHAPE

- Description**
 - ◆ How **Bow Position** & **Bow Vectors** interact with **Arm Gesture**
- Application**
 - ◆ Curves, ovals, infinity, loops
 - ◆ Parametric Curves → sinusoidal, Lissajous figure



DIRECTION

- Clockwise**
 - ◆ Bridge Curve + Down Bow
 - ◆ Reverse Curve + Up Bow
 - ◆ string vibration on all Up Bows
- Counterclockwise**
 - ◆ Bridge Curve + Up Bow
 - ◆ Reverse Curve + Down Bow
 - ◆ string vibration on all Down Bows

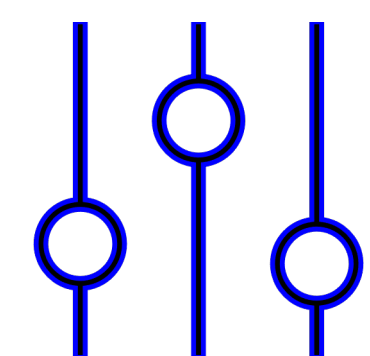


ANGLES OF THE BOW

VECTORS OF THE BOW

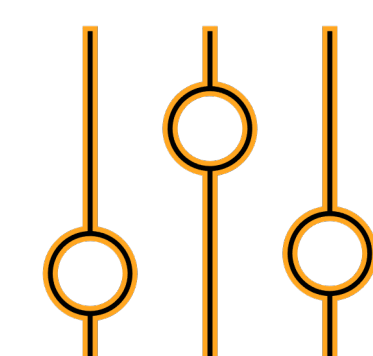
TILT

- Polarity**
 - ◆ Positive (stick leans to the fingerboard)
 - ◆ Negative (stick leans to the bridge)
 - ◆ Hair Compliance → less bounce, low resistance (ideal for harmonics, brush strokes, shorter **string lengths**)
 - ◆ Increases **range of Inclination** for Down Bows → *drogue* effect
- Neutrality**
 - ◆ Zero tilt (stick directly overtop the hair)
 - ◆ Hair Reflexiveness → more bounce, high friction, high resistance (ideal for *bariolage*, *spiccato* & *martalé* strokes, long **string lengths**)
 - ◆ Increases **range of Inclination** for Up Bows → *drogue* effect



VELOCITY

- String Length/ Pitch**
 - ◆ **Fixed Formant Function** → $v \propto 2^n$ (as string length is halved OR $2f_n$, **speed** doubles)
 - ◆ **Fractional Formantation** → v (as string length is halved OR $2f_n$, **speed** is constant)
 - ◆ as string length decreases, **Tilt** increases independent of **speed**
- String Stiffness/ Formant**
 - ◆ more String Stiffness → Less **speed** (speed *increases* when **Formant** increases)
 - ◆ more String Stiffness → More **force** (force *decreases* when **Formant** increases)
 - ◆ affects string Amplitude & **Density** (independent of **Formant**)



SKEWNESS

INCLINATION

- Slant**
 - ◆ Tip/ screw away from parallelism to the bridge → **Formant** travel (drifting)
 - ◆ Affects **Bow Hold** & **Arm Gesture**
- Dynamics**
 - ◆ Down bow → **crescendo** (tip down), **dim.** (tip up)
 - ◆ Up bow → **dim.** (screw up), **crescendo** (screw down)
- Plane**
 - ◆ 4 strings + 3 double stops → **7 primary bowing planes**
 - ◆ Governs string crossings (both slurred and separated)
- Range**
 - ◆ how close/ near the **Bow Contact Point** is to an adjacent string
 - ◆ Two "sides" to any Plane → enhanced **Articulations**

FORCE

PLACEMENT

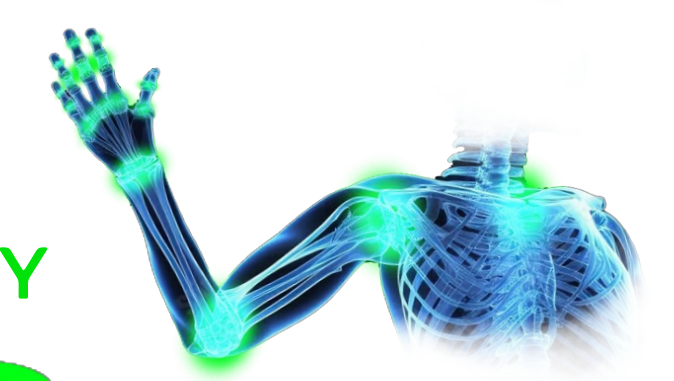
- Contact**
 - ◆ **Static Friction** (Bow & Arrow)
 - ◆ **Dynamic Friction** (Rock Skip)
 - ◆ **Torque** (rotational force)
 - ◆ affects **Density** independent of **Velocity** & **Placement**
- Non-Contact**
 - ◆ **Gravity** (Weight) → *dropping* vs. *lifting* based on **Impulse**
 - ◆ **Inertia** vs **Momentum** vs. **Propulsion** from **Arm Gesture**
- Bow Contact Point**
 - ◆ **Fulcrum** (Distance from Frog) → 2 middles (*hair* vs. *stick* middle)
 - ◆ **Tilt** (*hair*/ stick angling + **Clock Direction**)
- String Contact Point**
 - ◆ **Formant** (Distance from Bridge) → affects string **amplitude** & **Density** independent of **Speed**
 - ◆ **Skew** (tip/ screw angling + **Clock Direction**) → **Formant** travel)
 - ◆ **Incline** (pivoting side of the string angle + **Clock Direction**)

GESTURE OF THE ARM

HOLD OF THE BOW

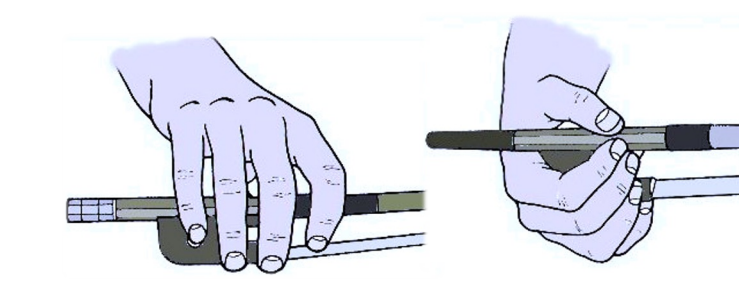
FLUIDITY

- Flexibility**
 - ◆ Range of motion in muscles, ligaments → extensibility, elasticity of soft tissues
 - ◆ **Kinesthesia** → awareness of **Vectors** during movement
- Mobility**
 - ◆ Range of motion around Joints/ Hinges → free, **functional** movement
 - ◆ **Proprioception** → awareness of **Position** regardless of movement



DEXTERITY

- Equilibrium**
 - ◆ Stability
 - ◆ Balance
 - ◆ Naturalness
- Functionality**
 - ◆ **Leverage** (mechanical advantage)
 - ◆ Control, *finesse*
 - ◆ Articulation, springiness



CHOREOGRAPHY

ARTICULATION

- Posture**
 - ◆ Positions of **Mechanical Advantage** → Efficiency & **Power**
 - ◆ Synergistic muscle activation
 - ◆ Transportation through all **7 Planes** → **Inclining** vs **Declining**
- Timing**
 - ◆ Cadence of movement → Rhythm & Flow
 - ◆ Hierarchical joint action
 - ◆ Consecutive **Bow Trajectories**
 - ◆ **Entrainment** → groove
- Upper Arm Fulcra**
 - ◆ SC Joint (where the sternum & clavicle meet)
 - ◆ GH Joint (ball & socket shoulder)
 - ◆ Elbow Joint
- Lower Arm Fulcra**
 - ◆ Wrist Joint
 - ◆ MCP Joints (biggest knuckles)
 - ◆ PIP Joints (middle knuckles)
 - ◆ DIP Joints (tiny knuckles)
- Phalanges**
 - ◆ Antennae for sensory feedback
 - ◆ Independence, aliveness
 - ◆ **Leverage**, shock absorption
 - ◆ Counterweight **force**
- Thumb**
 - ◆ Smartest finger (brain of the hand)
 - ◆ Tension regulator
 - ◆ Sensory bandwidth
 - ◆ Responsiveness, adaptability
- Overhand**
 - ◆ Typically referred to as "French"
 - ◆ Pronated (internally rotated)
 - ◆ Focused on **Lower Arm Fulcra**
 - ◆ Facilitates efficient **string crossings**, legato bow strokes
- Underhand**
 - ◆ Typically referred to as "German"
 - ◆ Supinated (externally rotated)
 - ◆ Focused on **Upper Arm Fulcra**
 - ◆ Facilitates efficient **bow force**, *spiccato* bow strokes