WORK-ENERGY

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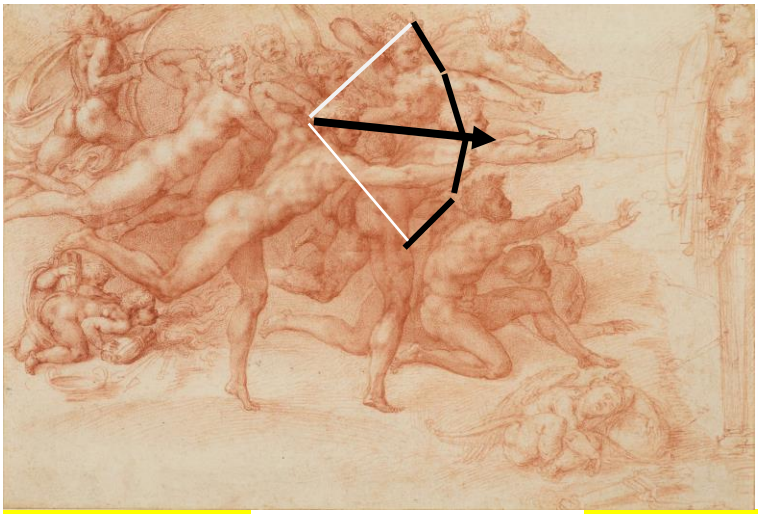
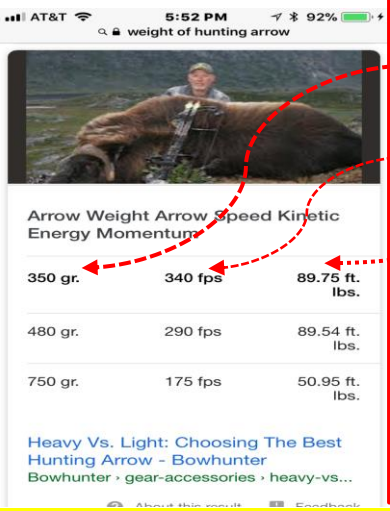
jpcise@austincc.edu , **New York Times, November 10, 2017, by Holland Cotter. Dedicated to Calder, A Great mobile art maker.**

Michelangelo Is the Divine Star of the Must-See Show of the Season

Metropolitan Museum of Art is a monument to a monument. With more than 200 works, and a core group of 133 drawings by the beyond-famous artist — the largest number ever assembled — on loan from some 50 front-rank collections, it's a curatorial coup. More important, it's an art historical tour de force: a panoptic view of a titanic career as recorded in the most fragile of media — paper, chalk, and ink. It's a show with demands: It requires that you be fully present. Snapping it with smartphones won't do. Drawing is more than a graphic experience; it's a textural one, about the pressure of crayon and pen on a page; the subliminal fade and focus of lines; the weave and shadow-creating swells of surfaces. Barely seeable, never mind photographable, these effects are, one way or another, the truest evidence of the artist's hand.





Introduction 1: The table at left ,from Bowhunter magazine, lists in **left column** three arrow weights in grains(**gr.= 1/7000 lb**.) **Middle column** lists their corresponding speed (ft./s.) when shot. The **third column** lists the work done in pulling the bow string back and thus ending up as **elastic potential energy** prior to being shot.

"The Archers," from 1530–33. Like many of Michelangelo's quasi-mythological drawings, the subject of this one, in which the archers have no bows, is a mystery. And a final drumroll: The fame of Michelangelo Buonarroti may last long, but this Met-built monument to him, which opens on Monday, Nov. 13, will not. It's a one-stop event with a non-extendable three-month run, which is the maximum exposure to light, even at dusk-level, that the drawings can safely stand. **Once the show's done, the likelihood of there being another on its scale within the lifetime of anyone reading these words is slim.** Giving a full account of anyone's art means giving a sense of where it came from, and we get that here. Although Michelangelo would have been the last to tell us — he liked to present himself as a parthenogenetic wonder — he did have some art training. **Born in 1475 into a line of minor Florentine nobility**, he entered the workshop of Domenico Ghirlandaio as a pupil-apprentice at age 13. From that fastidious painter he may have learned the practice, uncommon at the time, of **making preparatory drawings for work in more permanent mediums.**

INTRODUCTION (2): Work to pull a bow string back = $W = F_{AVE}\ X = [(F + 0)/2]\ X$, note initial force as arrow is pulled back is zero and F is maximum at end of final pull displacement. Since spring constant $K = F/X$, $F = K\ X$ .Thus, work to pull bowstring back displacement X is $W = [F/2]\ X = [K\ X/2]\ X = ½\ K\ X^2$. $½\ K\ X^2 = U$ = Elastic potential energy in bowstring when pulled back Displacement X. With no friction, $W_{friction} = \Delta K + \Delta U$, thus, $0 = ½\ m\ V^2 – ½\ K\ X^2$, thus **$½\ m\ V^2 = ½\ K\ X^2$**

QUESTIONS: Verify the three speeds produced in above table from arrow weight given in left column and elastic potential energy listed in right column?

HINTS: 1 grain = 1/7000 lb. , mass = weight/gravity, g = 32 ft./s.^{2}