

ENERGY-WORK

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Grande St., Austin Tx. 78701 jpcise@ausincc.edu % New York Times, April 24, 2017 by Jere Longman

At 17, 'the Tiger Woods of Pole Vaulting' Soars Ahead of His Time

Mondo Duplantis is the only high school vaulter to have cleared 19 feet, and he has done it twice this year.

LAFAYETTE, La. — A pole-vaulting runway extends about 125 feet from the side of the Duplantis family's Acadian-style home, under a gate and into the backyard, where it ends at a foam landing pit, floodlit by a light made for an oil rig.

It was, until recently, the training site for the family's youngest son, Armand. On April 1, at the Texas Relays, he **(((vaulted 19 feet 4 1/4 inches)))**, a **national high school record**, a world junior record and the highest jump at any level of international competition so far in this outdoor season. A vault of that height at the Rio Olympics last summer would have won a bronze medal. "It is off the scale; nobody's seen anything like this," said Earl Bell, a prominent pole-vault coach from Arkansas who won bronze at the 1984 Olympics in Los Angeles and once held the world record. "He's the Tiger Woods of pole vaulting."



Duplantis vaulting at Sam Houston High School in Moss Bluff, La., on April 18.

INTRODUCTION: The kinetic energy ($\frac{1}{2}mv^2 = K$) of the pole-vaulter is transferred into elastic potential energy of pole then into gravitational potential energy ($U = mgh$). The article states the vaulter can run close to 10 m/s.

QUESTIONS: (a) Find mass of vaulter?, (b) Convert 10 m./s. to ft./s., (c) Find the vaulter's kinetic energy? Find in units of ft. lb., (d) Find the vaulter's gain in gravitational potential energy? Consider his center of mass rose 17 ft. = h, cm of human is 10 cm. below navel (e) How does (c) and (d) Compare?, (f) Why the difference (e) ?

HINTS: $g = 32 \text{ ft./s.}^2$, $3.37 \text{ ft.} = 1 \text{ meter}$, $\text{weight} = mg$

ANSWERS: (a) $m = 4.53125 \text{ slugs}$, (b) $v = 33.7 \text{ ft./s.}$
(c) $K = \sim 2573 \text{ ft. lb.}$, (d) $U = \sim 2465 \text{ ft./lb.}$, (e) U (gravitational potential energy) is about 4% less than kinetic energy input. (f) Probably some of the kinetic energy was lost in the elastic bending of pole.

"It's not safe, I don't think," said his father, Greg, a lawyer. So Duplantis trains at his high school, and field mice have the run of the training space back home. "They love a good pit," Greg Duplantis said with a laugh. "As do possums."

His father built a landing pit in the backyard, first using carpet foam bound with a trawling net. Eventually, the family upgraded to a regulation foam pit and the 125-foot elevated runway, bought at auction and made of plywood, an aluminum frame and rubber cushioning. In his bedroom, Duplantis keeps a signed poster, singlet and biography of **Renaud Lavillenie of France, the world-record holder at 20 feet 2 1/2 inches and the 2012 Olympic champion.**

At first glance, Duplantis, thin and rangy at **5 feet 10 inches and 145 pounds**, does not appear to be a world-class vaulter. **He also runs the anchor leg on Lafayette High's 4x100-meter relay; his split has been hand-timed at 10.55 seconds.** He has developed strength specific to his event, in part, by hanging upside down, like a bat, in the backyard and doing inverted pull-ups, using a device fashioned from a rope, foot straps, weights and a pulley.

"He's fearless," said Gavin Nettles, 18, a senior at Barbe High in Lake Charles, La., who competes regularly against Duplantis. "He looks at the bar and says: 'I'm flying over that. I'm taking it.'"

Its the best job of anybody in the world right now in maximizing the energy he brings down the runway and transitioning into the air,"