Pole Vault – It's a Matter of Critical Mass
Presentation by Marty Dahlman, Track Coach, Retired

Critical Mass- Definition – **point of change:** a point or situation at which change occurs

- Critical Mass in the Pole Vault is the moment of transition
  - Transition from horizontal energy to vertical energy
  - Transition from a running event (carrying a pole) to a jumping event (with a pole)
  - Transition from a speed/power event to a gymnastic/body control event
  - Transition from the body carrying the pole, to the body using the pole to attain both horizontal penetration and vertical height
  - It all happens at the PLANT!!!!!

Note – video of Bubka World Record Plant
Note – video of Ishbaenva World Record Plant
Note – video of Lavillenie World Record Plant

- The goal should be:
  - A perfect plant – that sets up optimal pole penetration
  - A perfect plant – that allows for maximum "swing energy" to be stored

And ultimately
The Vaulter getting inverted on a bent pole, which will then straighten "shooting" the vaulter off of the top of the pole

Note – video of Lavillenie Extension from top of pole
Note – video of Sam Kendricks extension from top of pole

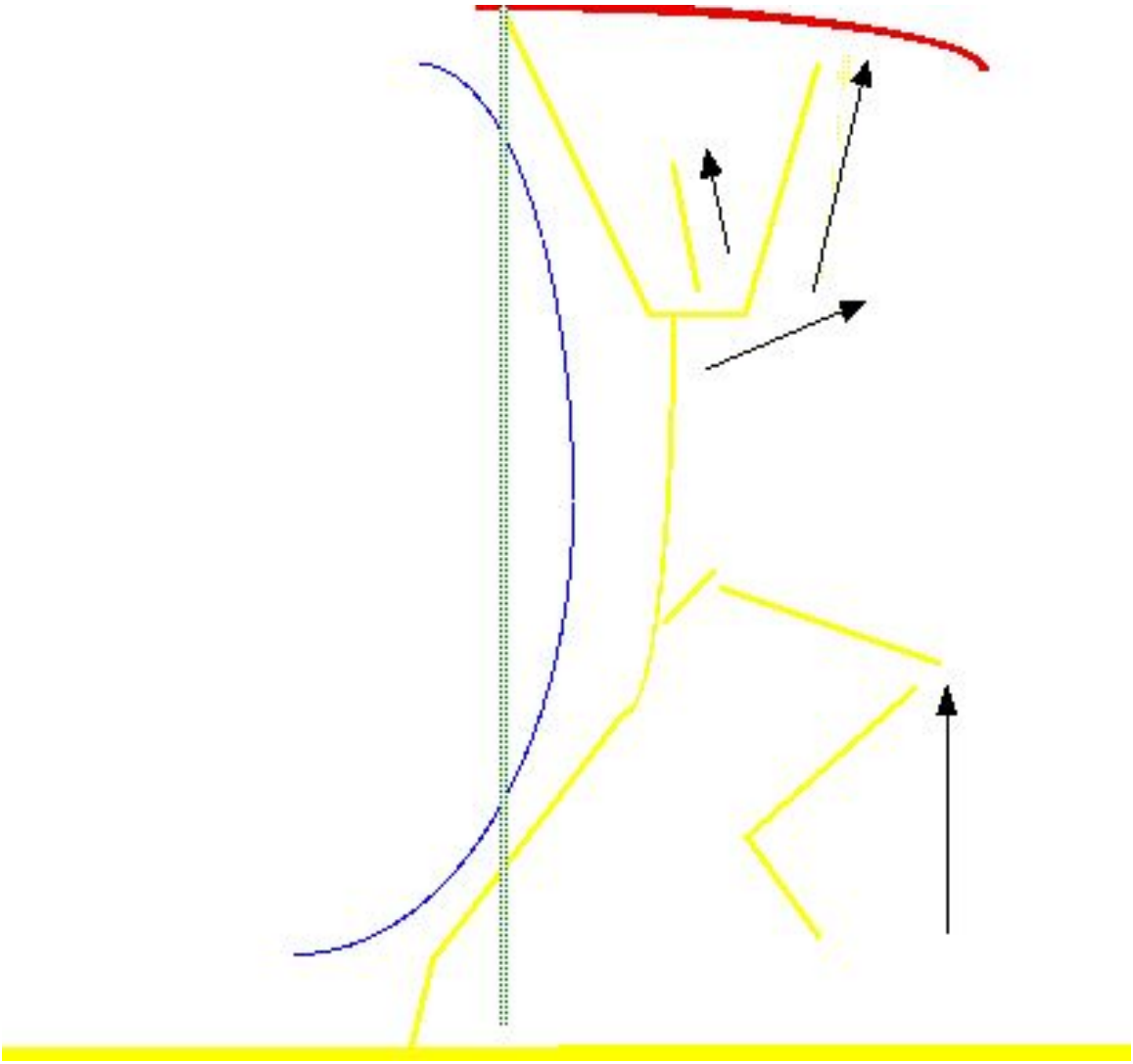
The Plant - the point of transition

- Goals:

Optimum Speed
Maximum Plant Height (height of top hand holding pole)
Plum Plant Angle (Top hand must be over toe of takeoff foot)
Pole/Body Alignment
Pole and body is aligned to vault "straight" into pit
Head/Top Hand Position Alignment
Top hand should be directly over and slightly behind plant side ear
Head should be up - NOT leaning forward towards box

The Perfect Plant
Positioning:
- Top Plant Hand is over toe of plant foot
- Head is up, torso is tall
- Chest is leading plant

ahead of hips
- Lower Arm is pressing up into pole - not pushing forward into pole
- Drive leg is at 90 degree
- hips are at a vertical attack angle



Key Points

1. Alignment of top hand to takeoff foot
2. Both arms up - pressure into pole is vertical
3. Head is up - not tilted towards box. Top arm is aligned with head
4. Chest is forward ahead of hips creating "reverse C"
5. Drive leg is near 90 degree creating a high hip angle at takeoff

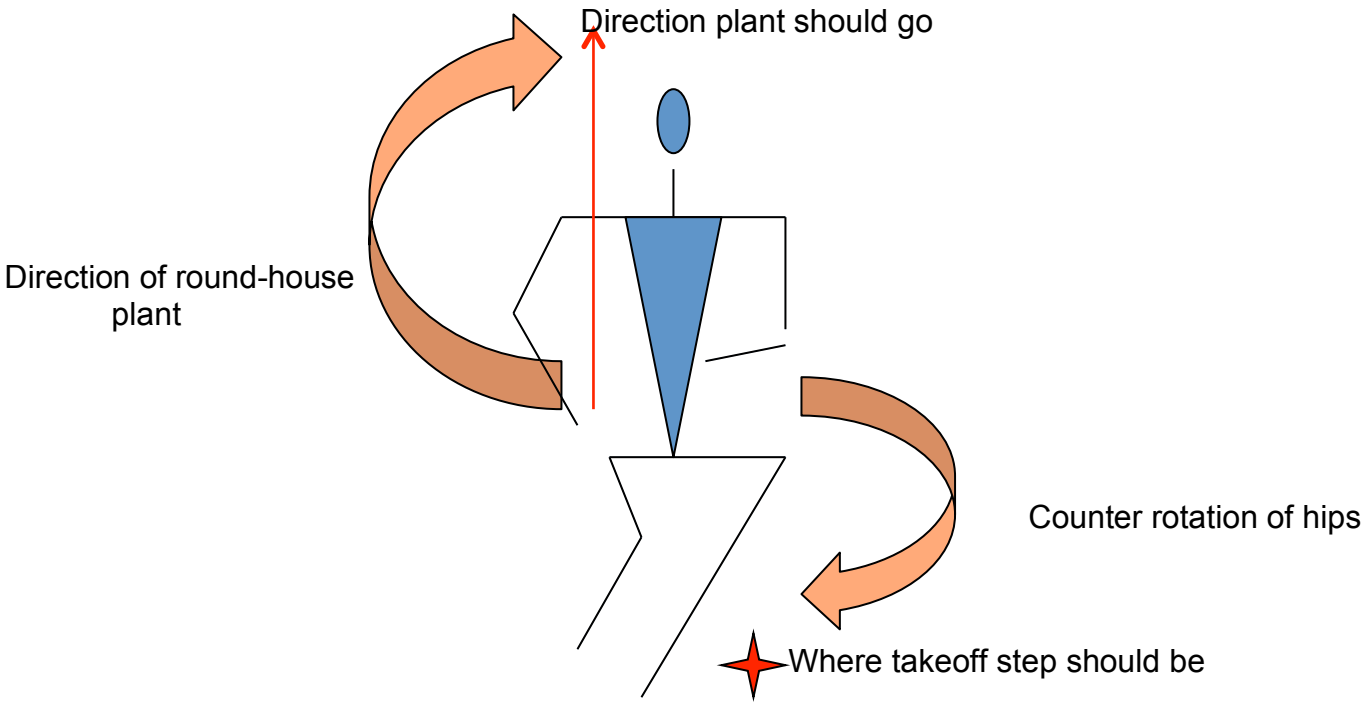
Note: Video of Tarasov's Vault

- What's so important????

- Alignment -
  - All motion and energy must be up and towards the pit - any erratic or sideways motions will come out during the vault sending the vaulter the wrong direction.

For Example - a plant that is "roundhoused" - that is - brought from the hip to the overhead position in a circular manner - creates a reaction in the hips and legs that causes the vaulter to step their takeoff foot across the runway - making them takeoff at an angle NOT vertical - and land on the side of the pit not the center. Energy is spent going sideways instead of vertical

A round-housed plant creates a rotational force



The result will be a counter-rotational force in the hips
Which will cause the plant leg/step to cross to the far side
Of the runway – making a plant/drive that is off line

- **What's so important???**
- Head Position - vaulters will <u>always</u> watch the tip of the pole go into the box. This IS a survival skill. However, if they allow their head to follow their eyes down into the box - their top arm will follow their head alignment and will go

forward instead of up. With the top hand position forward - the pole will be "pushed" ahead of the torso.

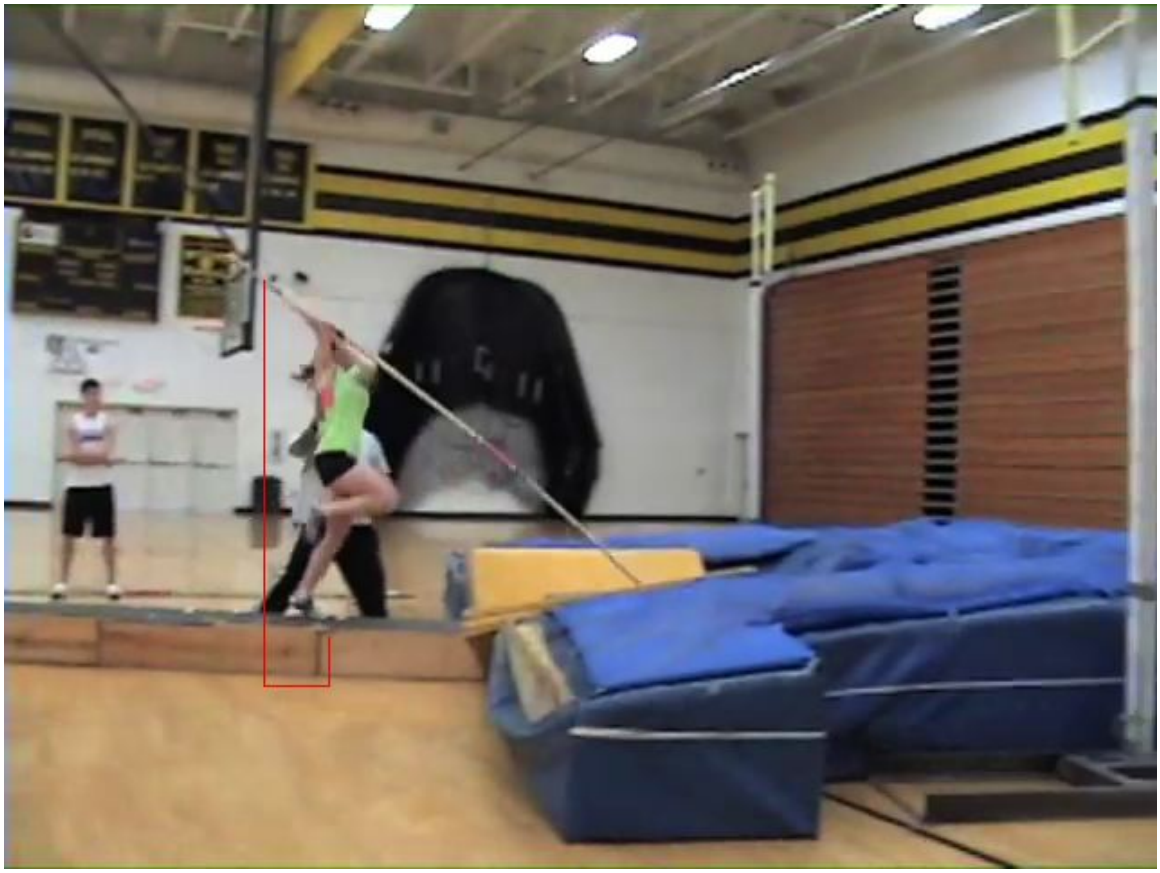
- This will have the same effect as an "out" takeoff step - lots of pole bend - not much penetration and much less vertical takeoff

Energy

- **What's so important???**
- Takeoff foot - top hand alignment
- If the takeoff foot is closer to the box than the top hand (an *under takeoff)* - then instead of the vaulter storing vertical (jump) energy into the pole, the pole instead "lifts/drags" the vaulter off of the ground - therefore using energy that is lost at the top of the vault.
- Hips are thrust forward due to body alignment – the vaulter then leads with the hips instead of the chest, gets less swing energy storage in the body, and less energy to swing rapidly up to the top of the pole

- This is Rachel, a vaulter from Watkins Memorial High School who went 10-6 in high school. She continued her vaulting career at Ohio University – where she is finishing her junior year.

Note – Video of Rachel



Rachel's step is too far under and she is unable to store energy in the pole - therefore she can't finish her swing up to the top of the pole, and she doesn't get a lot of penetration into the pit. It's all about the step being under!!!!!!!

Also - because the plant is under, she is unable to extend her top arm
Up into the pole - so she loses plant height (and energy)

Once the plant is executed correctly - the vaulter needs to swing from the TOP hand. The lower arm should be allowed to drag back to above the head.
Here's Austin – he was a hard working and talented state qualifying vaulter from Licking Valley High School. Now he's a Marine!!

Note – Video of Austin jumping

He has an excellent
Plant position. His top arm
Is over his takeoff foot.
His arms are extended up
Into the pole. His head
Position is up.
His chest is slightly in front
Of his hips and his "attack"
or jump Position is vertical

Austin's big problem: he
Will push into the pole with his lower arm.

This will have this effect:

- it will slow his swing down, so even when he gets to the top of the pole – it will be late – and he will not get "shot" off of the pole

It started happening
right at the plant, but
It's really apparent
right here>>>>>>>>
Instead of the lower
arm dragging back,
he's shoving it forward
into the pole.
Why??
Well, it's one way that
younger vaulters learn
to bend poles - and it's a
hard habit to break when they get older and better!!!!!

Executing the perfect plant *(an easy way to teach it):*

IT STARTS WITH A GOOD POLE CARRY

Right Angle Carry -

- Top hand open on pole (that way the pole remains straight down runway)
- Top hand located near hip - but not locked in
- Top arm bent at 90 degrees
- Lower Hand bent UP so that the palm faces the pole
- Lower arm at 90 degrees to pole
- Shoulders and hips at 90 degrees to runway
- Pole pointed STRAIGHT down the runway
- Run with high knees and erect body posture

Note: Video of Kyle's State Vault

Watkins and OSU Alumni Kyle Burns.

Note

- 90 Degree top arm
- 90 Degree lower arm
  - both from shoulder to wrist

and from the body to the arm

- Pole is less than 45 degrees but will follow body lean up as he increases speed in run
- Also - high knees and tall body posture

- The Pole Run should be smooth acceleration. Building to fastest optimum speed, with high knees and rhythmic steps.
- While getting the step on is a whole different session - some form of counting system should be used
- The best - count in 3's
- So - a Seven Step (that is seven steps with the jump step) would go like this (counting the jump foot step)
- 3 -- 2 -- 1 - 3 - 2 - 1; Then
- "flat - flat" - for both the penultimate and the jump step
- The advantages of 3-2-1's
  - To add an additional step - go 1 - then 3-2-1
  - To go to a short approach (for practice or bad condition meets)
    - Go 1- then 3-2-1 then "flat-flat" (5 total steps of the jump foot)
- The pole drop takes place through the last series of 3-2-1
- The Plant starts at the last "1" - and it never changes (no matter how
- many steps are taken)
- As the vaulter hits "1"
- The top hand goes from just above and behind the hip to in the ribs
- The bottom hand simply follows the pole up - no pull or push
- The top hand extends from the ribs to overhead
- The shoulder does move out of the way - but it does so naturally
- The pole tip should drop into the front of the box and slide in
- Not be slammed into the back wall of the box
- Final Outcome - the perfect plant position - ARMS fully extended
- BEFORE THE POLE HITS THE BACK OF THE BOX

Let's look at some plant examples:

- the first is World Class vaulter - Swetlana Feofanova

- she is one of the few vaulters who demonstrably "Pre-Jumps"
  - That is – she takes off from her jump foot BEFORE the pole hit's the back of the box
  - The advantage of this is a "higher" plant (the vaulter is off of the ground)
  - The dis-advantage – if the hips flatten, then the vaulter will get less vertical energy into the pole – and will store less swing energy to get inverted later in the vault

Let's watch her plant:

Note: Video of Feofanova Vault

Notice the pole remains straight – even after she begins her jump
Also – her hips travel at a more horizontal angle then other vaulters we've seen
She does get a lot of energy stored in the pole – and she does make it work into an excellent vault

The "plus" of her Pre-Jump – she stores energy into the pole
But what is missing:
She "meets" the pole at vertical – she doesn't "beat" the pole to vertical
she doesn't get inverted and lined up on a bent pole, and therefore doesn't get as much vertical energy from the pole

This is Austin:
He was a state qualifying vaulter from Watkins
Now he is a coach and teacher in West Virginia.
A lot like the other Austin – this one will "push" into the pole with his lower arm
It gets a lot of bend – but stops the swinging action

Note: Video of Austin Jumping

This is Jimmy:
He was an indoor state placer from Lakewood
Jimmy has a solid plant – and it sets up a nice vault
He does drop his drive knee just after takeoff – slowing
His swing up

Note: Video of Jimmy Vaulting

This is Kyle Burns:
He was a state runner-up from Watkins
He vaulted for the Ohio State University – and now is a Chicago Police Officer
Kyle sets up a great plant/drive/swing from a great run
In this vault

Note: Video of Kyle Jumping

This is Zack
Zack eventually went 14', and continued to vault
In college –
However –
On this vault he was "eaten" by the pole
Why –
His step is so far under…

Note: Video of Zack vaulting

Plant Mistakes:

1. Step too far under
   - Vaulter is dragged off of the ground
   - unable to store energy
   - *fix - move step back - easier said the done!!!*
2. Step too far out
   - vaulter pushes plant to box - big bend - not much lift
   - vaulter may not make it into the pit!!!!
   - this IS the easiest way to break poles!!!!
   - *fix - move vaulter in*
3. Vaulter is jumping from side of runway - not from the middle
   - vaulter will land on sides of pit instead of "coaching box"
   - vaulter will "roll bar" sideways instead clearing vertically
   - *fix - watch for "roundhouse" plant - top hand circling from hip to plant instead of taking a straight line - also - look for cross carry on approach - rotating the pole into line will also rotate the hips out of line!!!!*

4. Plant is slightly in front of vaulter's head - pole is "pushed" instead of "pressed up"
   - will cause the vaulter to push lower arm - block swing up
   - coach should listen for the sound of the plant "thump" instead of "slide"
   - fix - have vaulter concentrate on planting in front of box not on back wall
   - fix - have vaulter focus on head position at plant/takeoff
   - fix - have vaulter think up (I tell them to change their "attack" angle to a higher angle)
5. Vaulter does not aggressively Jump/Drive on takeoff
   - will cause less energy to be stored in pole and vaulter
   - will make vault look "lazy"
   - fix – have vaulter jump up into plant
   - fix – have vaulter continue to press up into pole and back into ground on and after takeoff

- Drills
- - Left - Right - Lefts
- - Lift (hip) Drills
- - Running Pole Drops
- - Pole Runs with Little Hurdles
- - Sliding Box
- - Stubby Plants
- - Hurdle Pops

Note: Video of Drills

Note: Video of Lavillenie, Isinbaeva, Kendricks

- More pole vault information – www.watkinstrack.org
- Thanks to:
  - The OATCCC for their support for Pole Vault Education
  - Mark Hannay, former Chairman of the USATF Northeast Pole Vault Education Committee
  - Rob Wahl, Coach of Altoona Area High School Pole Vaulters

And a special thanks to the Watkins Pole Vaulters, who over the past 37 years have worked, been experimented on, and competed; and always been willing to trust and try new things. I've learned more from them than they have from me!!!!