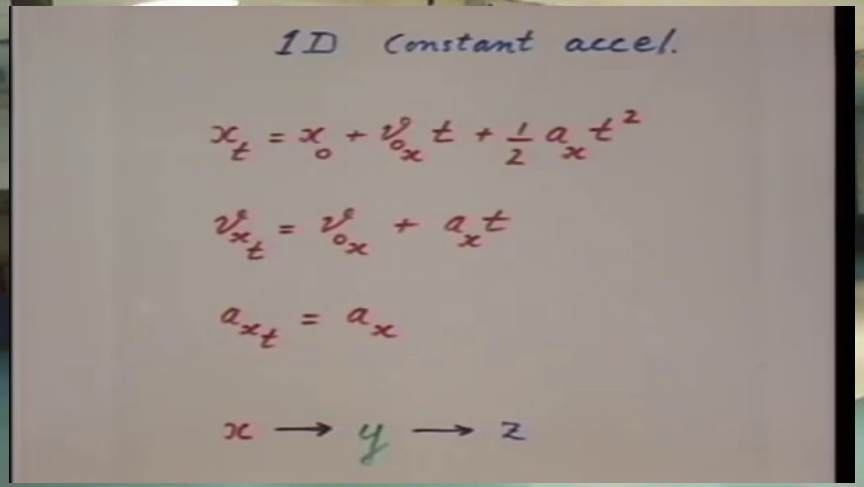
The Skate-Well Organization

The Science of Skating Well



Understanding Physics as it applies to Skating

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The Science of Skating Well

Our old friend, Isaac Newton didn’t skate. He probably was not even a little bit athletic. But, he did like to think a lot about the way things work and why. Skating would have provided him with many hours of consideration.

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The physics of good skating are very simple.

The rules that physics provide are applied equally to everything that we do as skaters so we should try to understand them and learn to work with them to our benefit.

The next few slides will present some things to think about when preparing for a jump.

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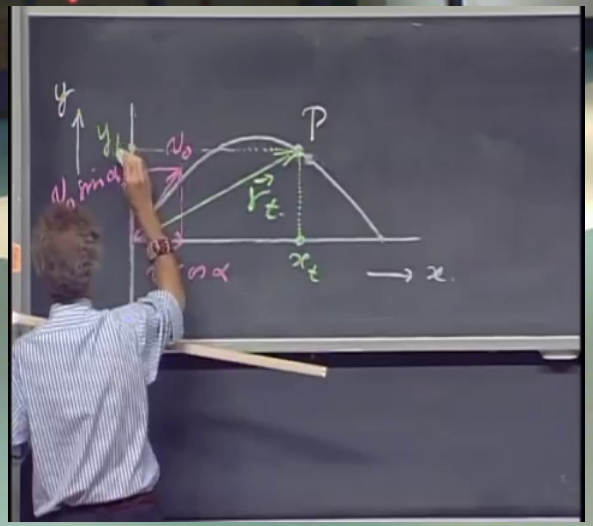
My favorite Physics Professor, Walter Lewin, of MIT , explains constant velocity and acceleration in a wonderful way. However you will endure little of the associated mathematics since it not the point of our exercise here today.



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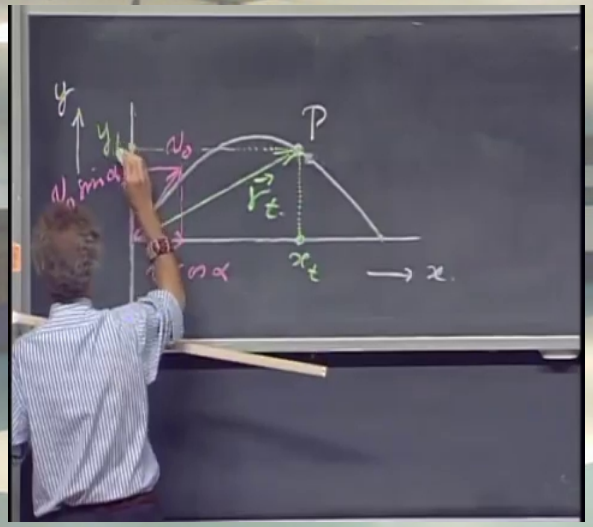
Professor Lewin has drawn on his board a simple chart of the independent movements of an object in space and time.



y = vertical x = horizontal t = time (P)osition in time = (yt xt)

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This is skating. Why, all of this physics and math stuff ?
Well, we apply these things automatically to all of the simple things we do, all the time, and without thinking about them.
Examples:
a. *Someone tosses a ball to you. You catch it.*
b. You walk upright.
But, sometimes when we try to do something new it may not work out as expected. So, we must learn to be observant and thoughtful. If not, our understandings will be incomplete and could fail or even become dangerous.
y = vertical x = horizontal t = time (P)osition in time = (yt xt)

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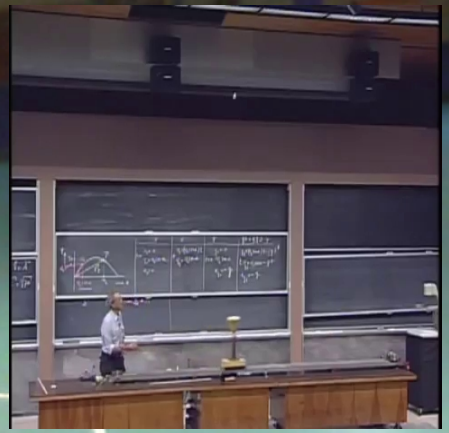
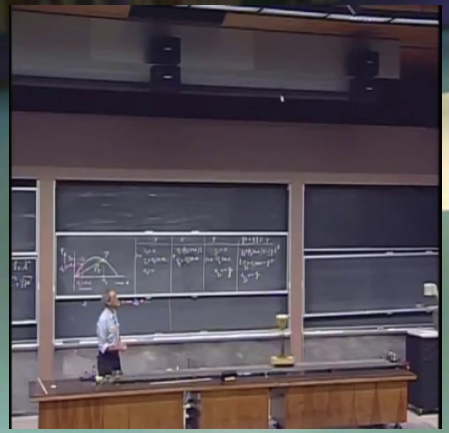
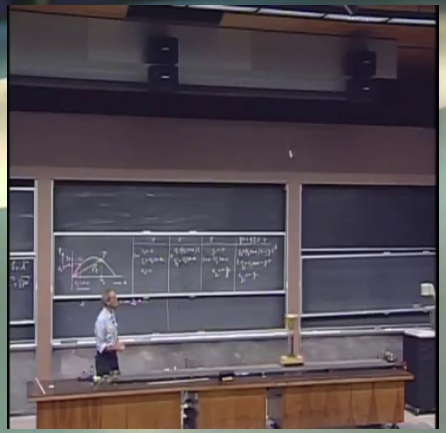
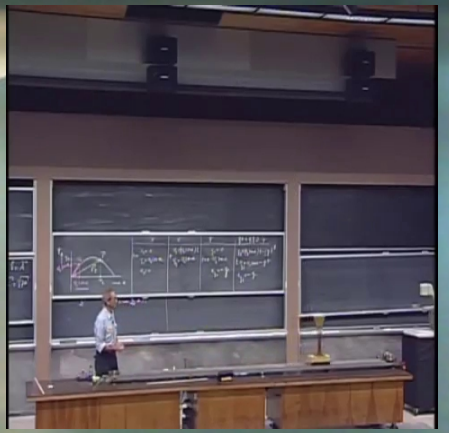
The series of images below may all appear the same at first. But if one looks closely they will notice a small ball in the top half of the first 3 and the item on the desk has moved. Look again and notice the position of the ball in relation to the thing on the desk.

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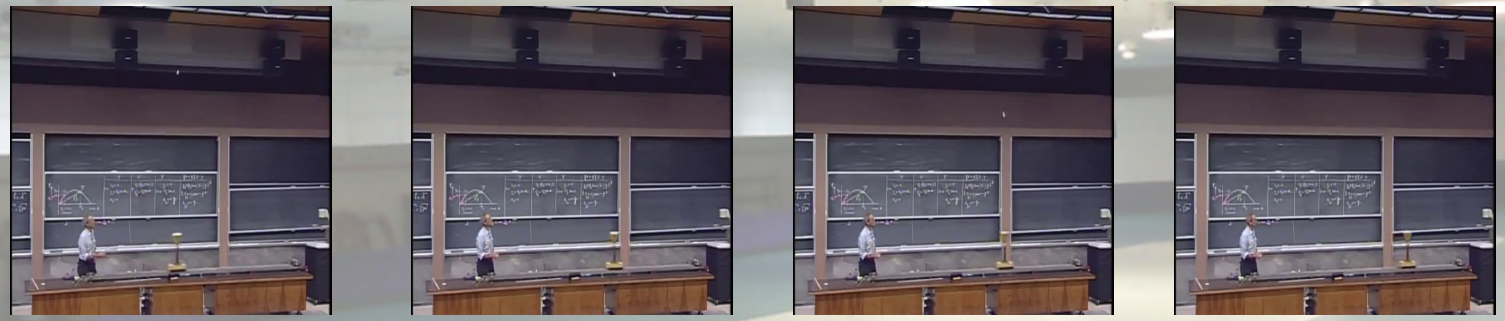
The dot in the air is a ball. The thing moving along the desk is a tube with a spring inside to push the ball straight up.



The tube with the ball is given a push along a track. As it passes a switch, it then springs the ball upward while continuing along the track, and catches it on the descent.

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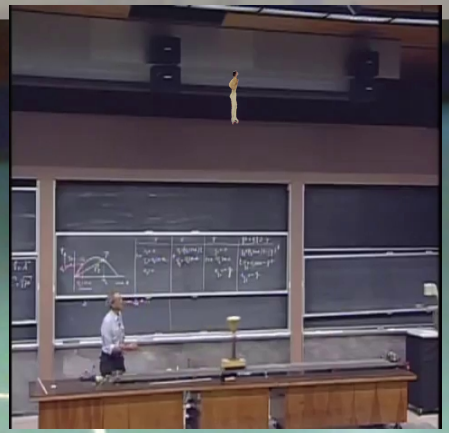
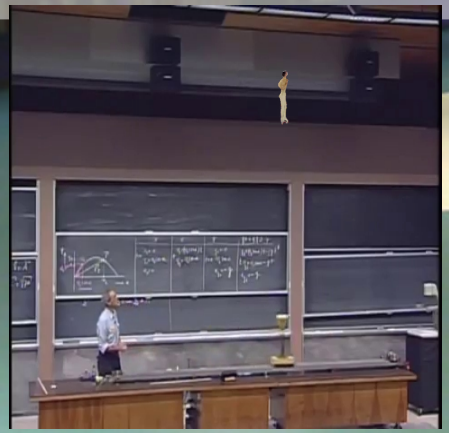
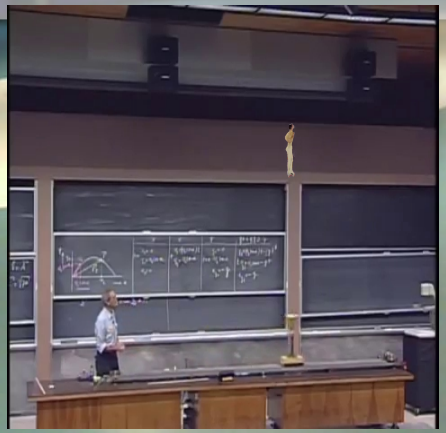
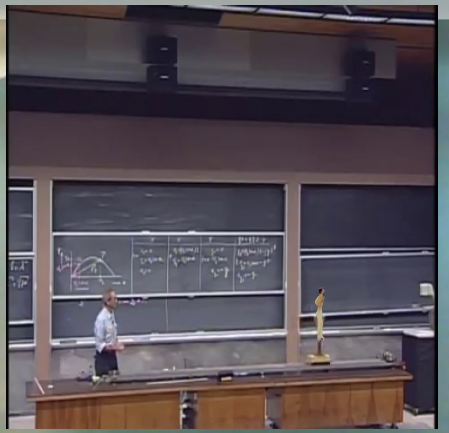
Notice our ball is now a skater, and is staying aligned with the tube as he rises and descends.
Since the tube was already moving down the track in our ‘x’ direction when it pushed the skater into the new ‘y’ direction the skater retains his original ‘x’ velocity during the flight and is able to land back into the tube later down the track.

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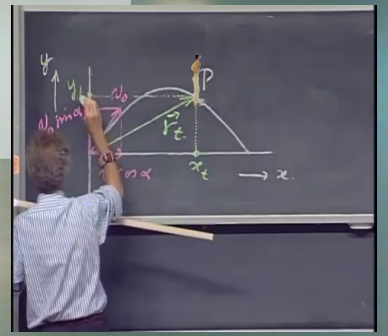
When we jump we want to feel like an arrow being shot straight upward in our ‘y’ direction.
If we happen to also be moving in some ‘x’ direction that movement continues, independent of any newly introduced ‘y’ motion.
Neither ‘y’ or ‘x’ know anything about the other’s action or position.



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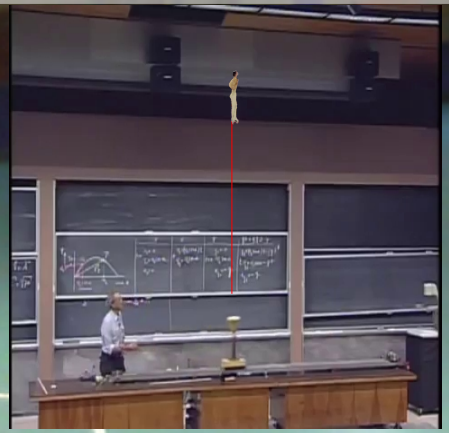
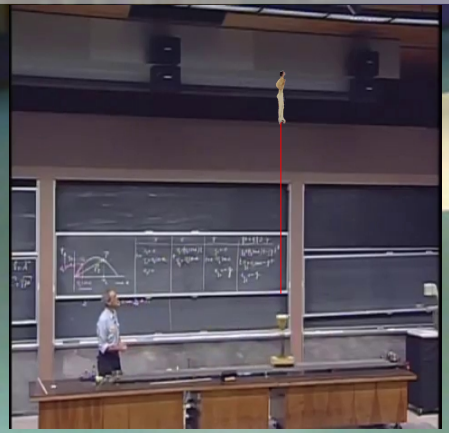
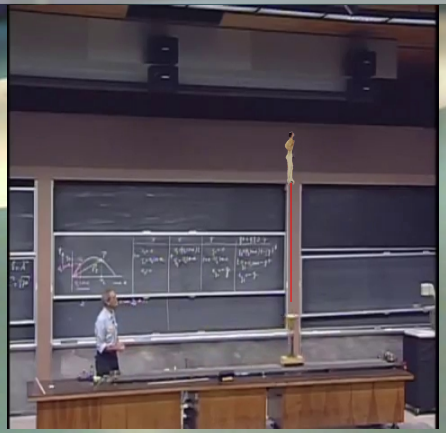
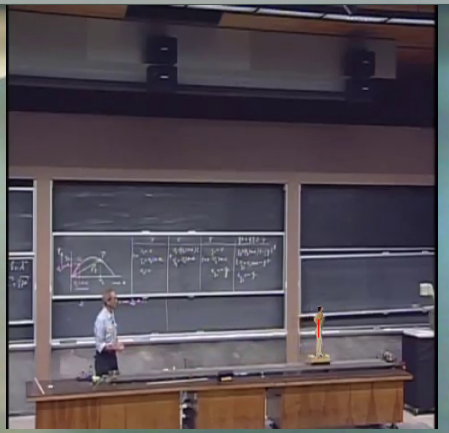
Of course, all of this depends on everything else remaining constant.

- The ball does have some big advantages over a skater, it has perfect symmetry, and is sprung out of a tube. But, a skater lacks that symmetry, and, in order to jump, rotate and land, they are always changing shape.
- Once aloft, the ideal shape for a skater is a thin vertical line or an arrow. With this shape the skater best minimizes outside drag and is better able to promote lift and rotational speed.

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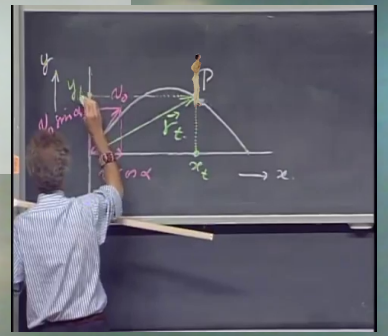
- Skaters are ill equipped for flight. Once a skater has left the floor and is aloft there is very little they may do to control or change their ‘y’ or ‘x’ direction of travel.
- However, when skaters are learning they often do try to find subtle ways to trick physics, which sometimes concludes with painfully unforgiving results.
- Remember: As long as you try to understand and work with it’s rules, Physics will be your helpful friend. Otherwise, your efforts may be set back.



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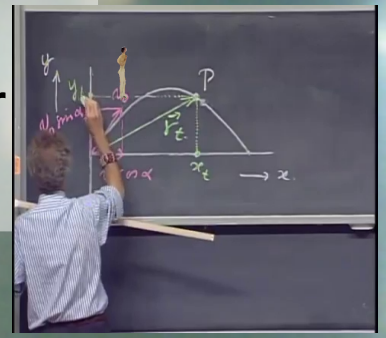
- As it is with any and all things complex.
- They are nothing more than a series of simple things well executed, timed, and seamlessly connected.
- Carefully deconstruct what you are attempting to do and completely examine each piece.
- Ask yourself if you are executing each as part of your effort? Or is something else happening or missing.



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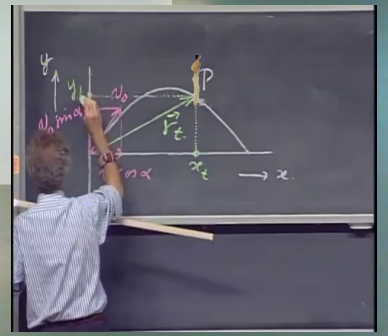
Every jump must be propelled straight up. To do this:

- Make sure your head and eyes are up.
- Keep your spine and neck long and straight.
- Use the power of your legs to lift your body weight.
- Do not break or bend at the waist.
- Body and limbs are held tight and solid the whole time.
- Lifting the shoulders does not help, press them down.
- Legs must be fully extended and any wrap must be kept at the shins and below the knee.



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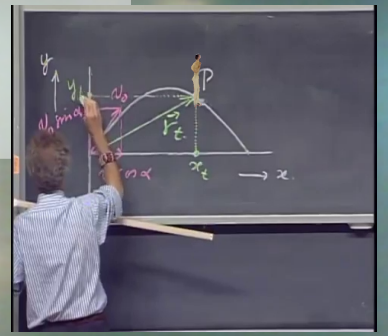
- Think about the way things work the way they do.
- Physics rules apply to equally to everything.
- Knowledge is gained through thoughtful observation.
- Success is knowledge correctly applied.



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