

Rhino 3d is used for architectural design, rapid prototyping, reverse engineering, and more. Today, you'll be using it to solve a mystery.

For reference, this is a great resource:  
[http://docs.mcneel.com/rhino/5/help/en-us/commandlist/command\\_list.htm](http://docs.mcneel.com/rhino/5/help/en-us/commandlist/command_list.htm)

When referring to a direct command (to type into command prompt), I will use quotation marks. Turn layers on only as you reach relevant clues, or this won't make any sense!

This is a work of historic fiction.

The year is 1888; George Westinghouse and Thomas Edison are at war over electricity. In the midst of the very public feud, a young man, the cousin of George's wife Marguerite, is found electrocuted near the tracks behind Solitude Estate - alive, but badly burned and unable to recall anything from the night before. Because of the potentially bad publicity surrounding his DC power, George wants to keep this quiet, but Marguerite is convinced someone tried to harm her cousin intentionally. Most of the staff are excused for holiday, and the estate has been quite empty for the last few day.

They turn to you, a private detective - apparently with access to futuristic crime-solving software - to help resolve what happened the night before.

As George offers you a map of the grounds, pointing out where the young lad was discovered, he pauses and then redirects you to an outbuilding - his laboratory - and confides that, in addition to his cousin's misfortune, a number of papers went missing last night. These folios were in preparation of a patent for a much more accurate meter gauging and stabilizing the direct current, a project he and Tesla had been working on for months. They needed to be found, and quickly.

## *CLUE 1*

As this is your first time on the Westinghouse Estate, and two crimes were committed in the area, likely linked, you take a minute to get the lay of the land.

**activate layer "map of grounds"**

**"PictureFrame"**

**select 1890.jpg**

**enter 0,0 (to start corner at origin of file)**

**enter 13.68" (to give length of long side of page)**

**"Scale"**

**click on the map to select it**

**enter 0,0 (coordinate of where to start scaling)**

**enter 200 (scale factor - see note on jpg)**

**"Scale"**

**click on the map to select it**

**enter 0,0 (coordinate of where to start scaling)**

**enter 12 (scale factor - scaling from inches to feet)**

After briefly surveying the grounds, you go to visit the victim, who had been staying in the topmost room at Solitude, and, despite the difficulty his location poses to those tending his injuries, is housed there still.

*CLUE 2*

**"NamedView"**

**select Visit the Victim view and click  
Restore**

You speak with him for a short while, trying to get a sense of his character, while looking about the room. You notice some rocks and minerals next to his muddy boots, and inquire. The bandaged man's face reddens, as he exclaims he is a bit of an amateur geologist.

### *CLUE 3*

Marguerite brings to your attention a single witness - a ticket man leaving his shift and walking home. The witness tells you he saw a large man striding across the yard, pause and pick something large off the ground, and then disappear into thin air. He shows you where he was standing and points to where the man disappeared.

#### **"NamedView"**

**select Witness's Perspective and click Restore**

Before you can walk back over to where the witness saw the figure disappear, it starts to snow. It has been unseasonably cold, and the ground is still frozen hard from one day before, when the crime(s) were committed. You head back towards the house in a hurry, and trip over a long, heavy rope on your way to the greenhouse to warm up.

#### *CLUE 4*

The rope sits under a scrawny bush, hastily covered, and not far from the tower. You glance up at the cousin's guest room and back at the rope, trying to calculate the approximate height of the window, compared to the length of the rope.

#### **"Length"**

**select the rope**

#### **"Distance"**

**click one of the corners of the window on the of the victim's room**

**turn on Project in your Osnaps panel, and click on the same corner**

## *CLUE 5*

After taking tea in the greenhouse - an enchanting place, though Marguerite apologizes for the mess (garden tools strewn about), excused by the lack of servants - you venture back out in the cold. Everything has been covered in a thin blanket of snow.

**"DisplayProperties"**

**"Yes"**

**Display Mode > Pen**

**Transparency > 100%**

## *CLUE 6*

You walk through the snow in the direction the witness was pointing. Near that spot, you notice a frozen puddle - likely frozen since the night of the theft and assault. In it are two distinct footprints, going just slightly off-axis from one another.

You use your plaster casting set to extract the shape of the footprints for later comparison, lest the ice melt and the evidence with it.

**"Box"**

**"P" [3 Point]**

**start point at edge of puddle, drawing inwards to cover one shoe-print, and click to commit to that rectangle  
snap to Near bottom of puddle thickness to get correct height for box**

**"Boolean2Objects"**

**"D" [UNCHECK Delete Input]**

**select puddle and the box you drew  
click through until only the footprint itself is visible**

**"[enter]" to accept**

**repeat for one of each footprint type**

**select your copied footprint sets**

**right-click on layer "footprint casts"**

**choose Move objects to this layer**

**hide layer by clicking the lightbulb icon besides "footprint casts" layer in palette**

And the snow does begin to melt.

**top menu: View > Shaded**

## *CLUE 7*

The trajectory of the larger footprints seems to be headed in the direction of the laboratory building. The building is plain, but the doorknob is brass, and you hope there might be some fingerprints left behind.

It looks like the criminal left behind a thumbprint on the back-side of the doorknob. You can use your tracing paper to extract it.

**show layer "trace paper print" and make active**

**go to Left viewport**

**"Project"**

**[make sure Delete Input is not checked, output layer set to Current]**

**select the thumbprint**

**"[enter]"**

**select the surface**

**"[enter]"**

**return to Perspective viewport**

**"SelLast"**

**"Group"**



## *CLUE 8*

The laboratory is locked, and George is away at the factory. Remembering that the trajectories of the footprints were different, and deducing that the two men were going in two different directions, you look around you to see where the other man was headed. The ground appears uneven in a few places between the two paths, as if someone had broken it up with a shovel, then patched it back together. The smallest patch seems the most recent and the most crude, so you go over to investigate.

### **"Area"**

**select each polyline patch individually -  
"[enter]" - to determine which is the  
smallest**

## *CLUE 9*

You very carefully peel back the patch of frozen grass and see an exposed wire, running, you suspect, between the house and the lab. So that no one unsuspecting finds this wire, you place a red flag of warning in the spot.

**activate "red flag" layer**

**"Line"**

**"V" [Vertical]**

**snap to point on red flag layer, and click enter "6' " for the distance**

**switch to Back view**

**"Polyline"**

**start at topmost endpoint (snap) of line you just drew (click)**

**second point somewhere slightly lower and a little to the right (click)**

**third point at midpoint (snap) of line you drew before (click)**

**"C" [Close] to finish the triangle**

**switch back to Perspective view**

**"PlanarSrf"**

**select the closed polyline you just drew**

**"[enter]"**

## *CLUE 10*

Not far from the spot, you notice steam rising from the ground. Upon closer inspection, you see a grate hidden beneath the overgrown grass that's been weighed down by the snow. An underground tunnel! This must be where the mystery man disappeared to. Assuming that the tunnel follows the trajectory of the electric wire, and assuming an even distribution of access hatches (for air circulation and emergency egress), you calculate the location of the other openings.

### **"Extend"**

**select the two lines on "tunnel" layer**

**"[enter]"**

**click both ends of the exposed wire line to extend it to each line**

### **"Divide"**

**select the line on "exposed wire" layer**

**"3" [Value]**

**"[enter]"**

## *CLUE 10*

Throwing caution to the wind, you remove the grate and climb down into the tunnel. A faint light glows in the direction of the house, which allows you to see a series of wires hanging above your head. You move quickly through the tunnel.

**activate "underground" layer**

**"Sweep1"**

**select the extended line on "exposed wire" layer, as your Rail**

**select the arched shape as your Cross Section Curve**

**"[enter]"**

## *CLUE 11*

When you reach the basement of the house, you notice the tunnel continues at a slight angle, but there are no lights, and it looks like the tunnel may have caved in near the end. You climb upstairs and run across the yard to where you suspect the tunnel opening is.

**activate "tunnel 2" layer**  
**select arched section from this layer**  
**"Extrude"**  
**"150' " [Distance]**

## *CLUE 12*

At the end of the other tunnel, you see a giant man, shivering, his leg trapped under the pile of fallen stones. You see what looks like the patent papers, also trapped beneath the brick and stones, but your compassion prevents you from handcuffing him before he is freed from his painful prison - you drape your coat over him and free him from the rubble. You fashion a makeshift splint with steel rod and the man's pantleg, then you help him walk slowly back to the house.

**go to Top viewport  
activate "drape" layer**

**"Drape"  
draw window around the rectangle on  
"drape" layer  
"10" [Spacing]  
"[enter]"**

**return to Perspective viewport**

**select the draped surface  
"Move"  
"V" [Vertical]  
"2" "**

**deselect all**

**activate "splint" layer**

**"Loft"  
select three circles around his leg  
"[enter]"**