RAMY HANNA: So we good to start? Good. I got the thumbs up from the back of the room.

So welcome to Render Like a Photographer. And it's really cool that we're in this room doing a live stream, so thanks to those of you who are in the audience and thanks to those of you who are watching online. So that's really cool.

My name is Ramy and I'm a partner with Tiltpixel. And there's my Twitter handle if you want to follow me. You can do that. You can also follow us @tiltpixel.

And this class-- just to make sure you're in the right class. I've done this class several years in a row and it's kind of neat to see that they've asked me to come back and present it again. It's kind of a timeless class because it's not so much-- it is a little bit software specific, but more of it is principles of photography, which is very timeless. So we'll be going through those principles of photography.

And at the end of the class we're going to learn how to tell the good renderings and the good photos from the bad ones, which is really important. We're going to look at three principles of photography and we're going to discover the four rules of photography composition. And then we're going to dissect some-- at least four photographic phenomenon and how they affect images, how we'll get them into our renderings and how we get them out of our photographs.

So a little bit about who we are. I'm at Tiltpixel, and I've been with Tiltpixel for three years now. My background is in architecture. I worked at an architecture firm for eight years doing renderings and animations.

This is a sign outside of our office, just in front of our office, and we built it out of LEGOs. And it's a little bit about who we are. And we like to have a lot of fun, and so this was a little deal that shows kind of it close up.

We had someone in our office said, you know, Google's got this really nice sign out of LEGOs. We've got to do that. So we called someone who does LEGOs-- you know, that's their job-- and we got a quote for $50,000 and we're like, uh, I think we'll pass on that. And the lady said, good luck. You guys can--

So we ended up-- we mocked it up in 3D, of course, and we ended up being able to build it. So it turned out pretty nice.

We do renderings, animations for architects and developers, and I'll show you-- before we jump into the presentation, I'll show you a little bit of our work so you can get an idea of what we do.

So that's a little bit of the work that we do, and that was-- we put that together for this year. That's our 2015 work. And so we had a lot of work this year and particularly animations, they seem to come like fashion. We did still renderings for a very long time and now everyone's asking for animations. They've come back, so we're doing a lot of animations.

To get back to where-- the foundation of where that all came from, I did renderings for-- I've been doing it for over 10 years. And the first rendering I did, it was of a building and an architect looked at it and said, that building just doesn't look quite right, you know? The verticals aren't straight.

I said, what do you mean, the verticals aren't straight? Well, he's like, if you take a photo of a building everything has to be straight. And I had no idea what he was talking about, and so I realized that I've been doing renderings and I knew the software but I'd been doing it all wrong.

And so I went back and said, you know what, I'm going to pull away from the software and I'm just going to spend some time studying photography, look at some of the architectural photographers and some of the greats of the past. And so I'm going to look at some photography examples.

And so I went to Julius Shulman, who's done many architectural photographs. And the first one he's done-- well, that I've put in, was a Case Study, House Number 22. And it was an experiment in American residential architecture where he was commissioned by major architects to photograph these. And the idea was that these were day to day design and build inexpensive, efficient homes for the US caused by the end of World War II.

Well, what's interesting, there's nothing really special about the photo. But if you look at it, it's actually a double exposure. There were seven minutes of exposure for the background while all the interior lights were off, and even the models that were sitting in the room, they were sitting in the dark. And there was a flash shot for the interior and the house lights, they were replaced with flash bulbs.

And so you think about all the planning and preparation that went in for one shot to think that he had these models sitting in the dark and he had a shutter open to expose all the lights in the background, and then as soon as they flipped the interior lights on, he released the shutter to get the exposure for both interior and exterior.

Now, he didn't have Photoshop, so you know, he can't sit there with an HDR, 32-bit image and say I'm just going to tone map it and it's done. So there's a lot of planning and preparation that went into that.

This is the Singleton House. It's a very simple image. It's a one-point perspective, which you can never go wrong with a one-point perspective.

And I love how the building composes the image itself. It frames-- you have this part of the building right here-- see if I can get my little battery maybe out on this. There we go. So you see how the building composes the image and it actually makes a very nice composition.

This is the Kaufmann House. It's another-- it's close to a one-point perspective, but it's very simple. And he has the building composed in front of the landscape and it kind of sets it apart. He waited for a time of the day to make sure that-- you know, there was atmosphere and fog in the mountains and so he could separate that from the house.

I also looked at Ezra Stoller. He's another highly recognized architectural photographer, and he was commissioned by architects like Frank Lloyd Wright, Paul Rudolph, Eero Saarinen, I. M. Pei, Marcel Breuer, and Richard Meier. He's done lots of photos and I really like his photos because they're very dramatic.

This is the TWA Terminal, JFK Airport, and what I really like about this image is the curves of the building itself compose the image. And so you have this railing on the left and it comes around and comes to the bottom of the image. And then you also have the curves in the top of the ceiling which compose the image.

The other thing that's really nice about it is there's very strong vignetting which is caused by a lot of vertical shots. If you have a camera with a tilt-shift lens you'll get some very strong vignetting. Well, photographers try to avoid that. Well, him and Julius Shulman, they would embrace that and use that to create contrast.

This is the Marin County Civic Center. It's an interesting photo.

Again, it's very dramatic. And what I think is really interesting about this image is it's an image of architecture but he does have a person in there. He does have a-- there's one person right in the middle. And it really gives you a sense of scale, just adding that one person.

This is the Kitt Peak National Observatory. And again there's that one person all the way in the back and is very small. And if you didn't have that person in the photo, you wouldn't know what you were looking at. You wouldn't know if it was a table leg or an alien spaceship. It's really something different, but once you put that person in there it's like, OK. I get the sense of the scale of this thing.

So for me it was a rite of passage where I had to come back and start taking pictures and photos. And so I got behind a camera and started taking my own photos. So this is Sydney Opera House.

And started to apply a lot of the principles that I learned from these photographers in my own photography, and I ended up doing some photography for the architecture firm that I worked for. This is for SSW Group. This is the inside. This is the ceiling. So some detail shots, really just trying to understand lighting.

And along with photography you can also look at 3D examples. There are 3D artists out there who have really set the bar for renderings that apply these photographic principles to the renderings.

And I think there's none other than Alex Roman who's really set the bar for renderings at a very high level and using a lot of those photographic elements to make his renderings look realistic. Viktor Fretyan is another artist who's inspired me to do renderings that not only have great composition but material and light as well. And Peter Guthrie is a third who's very inspirational and has a good presence in the 3D industry.

And if you don't know who these artists are, I highly suggest that you look them up and see their works. They have plenty of work on the internet that's really inspiring.

And so what is it that makes these images look so good? What is it that makes them captivating? What is it that makes them interesting?

Well, the three principles of photography I've broken down into mood lighting, staging, and composition. And so mood and lighting, it's pretty straight forward.

Mood is kind of how you feel right? So in this image the content, it's all the same. They're all skies, right? So there's nothing unique about it. They're clouds, skies.

But if you look at the top one, clearly it's a nice day and, you know, it evokes a mood. It evokes a certain feeling. When you look at the bottom one, it's still a sky but we've got lightning and it's very stark and it's very foreboding. It's very dangerous. So the mood all of a sudden dictates how you feel about that image.

We take it one more step with our clients and we'll create what we call mood boards. And this is a mood board that we did for a client.

The architecture firm I used to work for, we did a lot of schools. And so clearly you can look at this and figure out that we're getting ready to create an image for children, for schools, this educational center. A lot of primary colors, a lot of children, a lot of things you'd find in a school, right?

This next mood board, it feels a little different. It's for a different generation. It's for-- maybe they're a little older than children, right? But they're not quite adults. It's somewhere in between. It's a little more hip.

And this last one definitely is more corporate, right? A lot of cool colors, very sleek, very clean. So something-- maybe creating a rendering for an office space, office building.

So you look at all three of them and they all have different moods, different feels. Well, you may not know it, but if you're on Pinterest, this is kind of a modern day mood board, right? And if you're on Pinterest and you start pinning all these things that you think I like this, I like this.

We have a client that loves Pinterest, and I didn't know anything about Pinterest. I didn't know how to use it. I was like, I don't know how it works.

She sent me this board I guess, and once I started looking at I thought, man, this is just like a mood board. Like she's picking all these images and they're all the same color, same tones. We were doing a rendering for her and basically it's white walls, wood floors, and so it gave me a sense for, OK, these are the colors and the textures that she wants to use in the rendering.

This is a rendering that we did for a client. Almost non-photo real. It's more of a sketchy style, but they wanted something more dramatic, something more moody, right? So we went with a

different style on it, just a little darker.

It was more dramatic. We made it dusk. We put the vignetting on the sky. And they loved it and it really was successful.

The other factor with mood and lighting is lighting, right? So I went back and looked at a camera and learned how a camera works. And it's really important to you-- if you're using 3ds Max or Maya or any 3D software that has a built-in camera, nowadays they all have the same parameters that a real camera does. And so it's important to understand how the cameras work.

And so I went back and really went back to study the way cameras work. And there's three factors-- the shutter speed, the aperture, and the ISO. And with the shutter speed, it's really the factor that your shutter, the longer it's open, the more light it's going to let in.

And so you can see on the very far left, you have a shutter that's open for 1/500 of a second. It's not going to let as much light in as one that's open for 1/40 of a second.

Now, what's interesting about the shutter speed, it's pretty straightforward. But the longer the exposure, the more blurry you're going to get, the more motion blur you're going to get with characters and things that are moving. So if you have trees moving, people walking, cars driving down the street, the longer your shutter is open, the more blurry they're going to be.

And that's how you get those nice shots with the car light streaks. It's because the shutter's open for a long time and they're getting all that movement. As long as the shutter's open, those objects are moving, you're going to get that blur.

The next factor is aperture, and aperture is not like the shutter how long it's open, but it's the hole where the lens lets the light in. It's how big that hole is in your camera in the end of that lens. And it's measured in a factor of f-stop.

So f-14 is actually a very small pinhole whereas an f here 3.4 is a little larger of an aperture. And so it may seem a little backwards. You'd think that a higher number would be brighter. It's the opposite. So f-14 is a lot smaller.

And what's interesting about the aperture is that the smaller the f-stop is, it affects your depth of field, that depth of field effect a lot more. So it's measured with f-stop. And the smaller the hole is, the less the light is allowed into the sensor.

And so if you have an f-3.4 you're going to get more of that depth effect. If you want everything to be in focus, you want a very high f-stop and that's a factor.

And then the last one's ISO, and this is kind of a fictitious value. It really-- historically you'd buy film and you'd buy different types of film speed. That's really what it. The ISO is film speed. And so you had film speeds that were ranged from 100 to 800-- different sensitivity to light.

And so once you bought that film, you couldn't change that film from 100 to 800. And so when they came out with a digital SLR, it's like this fictitious value that, OK, we're going to create an ISO and have it equate to film speed.

What's interesting about the ISO on a digital SLR though is the higher your ISO is, the more noisy your image is going to be because basically if you're in a space like this where it's very dark you're going to jack up your ISO, you're going to start to get noise in your image. So best practices are to keep your ISO as low as possible.

So that's lighting. So mood lighting, we got that.

So staging is another factor, and Julius Shulman was very good at this. He'd find an architectural space and just because the architecture was good, it wasn't good enough to say, OK, I'm going to shoot that. He would think about the furniture that went into the space. He'd think about where are the items that go in that space, think about how can we dress this up to really maximize the way the space looks, right? So staging is a big thing.

And then the biggest one I think is composition, and for composition I broke it down into-- because composition was so important, I broke it down into four rules of composition. So we're going to look at the rule of thirds.

And these aren't the only rules of composition. They're just four that I am choosing to talk about. But rule of thirds we're going look at, straight verticals-- which I kind of mentioned, and diagonals to corners, and then avoiding coincident edges.

And rules of thirds it's pretty basic but it was discovered by this guy Euclid, was a mathematician. And he discovered that there's this ratio going around that the sum of a plus b is to the part is equal to the part a as the part as is to b. So it's kind of this repeating pattern that this ratio is the same to this ratio as this ratio is to that. It's this repeating pattern.

And he didn't invent it. He discovered it. It's found in nature. And it's the golden ratio. And you

find it in shells, in flowers, in plants, and it's this repeating pattern kind of like this Mandelbrot pattern that exists.

And what people have discovered over the years is that they've applied it to architecture and it happens to be aesthetically pleasing. And historically they found that it wasn't only aesthetically pleasing, but they thought it to be spiritually important. They thought it was like tapping into some higher thing in nature, which is amazing.

And from the golden section that's where we get the Fibonacci spiral. It really-- it's the same ratio, and as you can see, it just repeats and repeats and repeats.

And so there were other people that knew about the Fibonacci spiral. And the Fibonacci spiral is really where we get the golden section. So if you break it out you get the golden section, and this is basically taking those lines based on the major points in the Fibonacci spiral.

And then somewhere along the line, I don't know if we got lazy or what, but that's where we got the rule of thirds and basically split the image up in three. So and you'll find on your iPhone or on your camera or any app you'll have those three lines.

And the idea is that you take your object that you're taking a picture of-- whether it's a person or a building-- and you compose it along those thirds, along those lines, and all of a sudden you have a more visually interesting or pleasing image compositionally. It's probably the easiest way to improve your composition.

So I went back to some of my renderings and I said, OK, so did I use the rule of thirds in these renderings? And I simply just went back to see if it applied to my renderings. And in some cases it worked, in some cases it didn't, some cases it got close. But I think it's important to understand these rules and then once you understand these rules you can break them.

Now, you can create this in Max and it wasn't intended for this, but I can show you how I do this in Max. Basically you select your camera and underneath that there's a Show Safe Frames and it will create that border. That's your safe frames.

And then under Configure we're going to turn a couple other frames on. If you hit the Safe Frames tab there's a action safe and a title safe, and so I turn those two on. And what I do is you apply it. You can see the blue and the orange, those are the actions safe and the title safe.

So then I will go back and I unlock the aspect on those two. And so for the horizontal I set it to I think I set it to 66 and the vertical I set it to 0. And for the title safe I switched it around and set it to 0 and a 66.

And when you do that it's creating a virtual rule of thirds in your camera or in your view port in 3ds Max, which is-- I use that sometimes to kind of see, OK, this is where my building is and I'll compose it. And so it's kind of a nice little trick. And if I'm going through these too fast they are in the hand out.

The other one I mentioned previously is straight verticals. And this is a photograph I took before I really understood any of these, and someone said you've got to straighten those verticles out. So, OK. So this can also be done in Max but just to show you a couple more photos. You can see that there's very strong vertical elements.

And architecturally this is a nice thing to do because when we look at buildings that's how our eye interprets. Our brain perceives things as straight. So even though-- like you're in your room at the Venetian, you're looking at the Palazzo or, you know, you see it straight. Now, in reality there's everything's in perspective and everything's in three point and everything's bowed, but this is the way our brain interprets things.

Now, this can be done in Max with the new physical camera. So if you select your camera, there's an area that you scroll down-- you can scroll all the way down. And there's lots of settings, but there's one under perspective control and you can control the vertical.

And there is a check mark to auto correct the vertical. So you don't even have to figure out what the number is. When you check mark that, boom, it automatically straightens that out.

So I'll go through it again. Make sure your camera's selected, scroll down to perspective control. It's auto-- basically auto vertical tilt correction is what it is.

So and then-- we'll see if I got this. So this is the rendering that we did that space. This is actually the same client that had that Pinterest board.

This can also be done in Photoshop. It's actually very easy to do in Photoshop. Just go to Filter and Lens Correction and go to the Custom tab. There are several settings in here that control a lot of these features. And there's a vertical perspective and basically it distorts your image. The thing with doing it in Photoshop is you're going to lose some of that image as you

straighten it out.

So the next one is diagonals to corners, and this is really straightforward, very simple, that the diagonals of your buildings will meet the corner of your image. And so in this case we have the beams running into the corner of our image on the left. Here we have a beam that's running into that top left corner.

And then the last one for composition is a little interesting. It's avoiding coincident edges. What I mean by that is if you look at this image, it's a little precarious because we have this coffee table sitting in front of this credenza.

And what's strange about it is the corner of that table is lining up with the corner of the wall, where the floor and the wall hit each other. And so it just feels really strange. You really wouldn't have-- I mean, they're in the right place in 3D but because of the camera placement, all of a sudden everything feels a little flat.

And so very simply either in real life you can move your furniture around or you can just move your camera around-- in this case I move the furniture-- and just shifting it so that the objects will overlap. So right now the coffee table now overlaps between where the floor and the wall meet, and now I have the coffee table in front of the credenza. And so it basically it adds a little bit more depth.

So that's composition. And now I want to get into photographic phenomenon and optics. And what's interesting about this is these are features and factors that photographers try to remove from their photos.

They're flaws in the way a camera lens works. They are things that we don't like to see. We don't want cheap lenses. We don't want all these factors.

And so these are the ones we're going to look at-- vignetting, chromatic aberration, barrel distortion, glare, flares, depth of field. Now, these are things that photographers will try to steer around, try to fix. When we're doing renderings and we're trying to make them look real, we actually add them into our renderings so it's a little backwards.

Vignetting, you've seen some images that already have vignetting. It's the matter that we have this dark border around this image. And a lot of it you really get that strong effect with a tilt-shift lens, you'll get some strong vignetting in your lens.

And some photographers will try to remove it. Julius Shulman, he embraced. He said that's the way the camera takes the picture. I love it. He just embraced it.

And we use it to our advantage, like this image. We have some strong vignetting in the sky and it really leads us to look at the building.

So this can be done also in Photoshop, and so here I'm going to try to go to a live demo. Let's see how this works here. So I'm going to go to Duplicate screen. There we go. So that's my Photoshop.

You can do this in Max. I like to do it in Photoshop because then I can control it. And the way I do it in post-- this is a rendering we did-- is I'll create a new layer and I have a gradient that I've made here. It's a color gradient.

And what it's really doing is it's simulating the iridescence that you get on a lens. If you look at a lens, there is a little bit of color, right? A little bit of bow on it. And so that's really what it's simulating is a lens.

And typically you could set it to a blending mode of Overlay. I think it's a little too much on Overlay. I like to set it to Screen-- or, sorry, Soft Light.

And it's very subtle but you can see that it kind of gives it that photographic effect and it keeps renderings-- they're not biased towards a camera. There's no camera and so it's just going to render things flat in the way that it should be in reality. If you had a perfect camera that's how it'd render. Well, in reality we have flaws in our cameras and so I will create that.

And you can go one more step and I'll color it based on the mood that I want. We talked about mood. I'll use a Hue Saturation adjustment layer and I'll apply it only to that gradient.

And what I'll do is I'll colorize it. And the colorizing, basically what it does-- you can see there it is if I turn my base layer off-- I'm colorizing it. And I can control the color of that filter.

So if I want something more blue and natural daylight I can come here. If I want something more interior lights and I want to use some more incandescent lights, I may come to a warmer.

And I'll turn down the opacity as well. So I won't do it at 100%, somewhere in between.

So the key with this is keep it really subtle. If the client looks at that and says, you know, what's wrong with the image, then clearly I didn't do my job right. So that's vignetting. So that's in

Photoshop.

The other one's barrel distortion, and every camera has a bit of bowing. And you saw that image where I had-- the verticals weren't quite straight and we're straightening it out. There was still some bowing on the verticals.

Every camera has a little bit of barrel distortion. If you have a really expensive lens, you might have better verticals, but depends on the lens. If you have a very wide angle lens, you're going to start to get more of that fish eye. And sometimes we'll either try to remove it or we'll try to add it into our renderings.

Well, the way we do that in-- let's see if we can get this to work. OK, the way we add that again is very simple. We just go to Lens Correction, and-- oh. Let me turn off my vignetting.

On the base layer go to Lens Correction and much like we had this vertical perspective there's also this remove distortion. So if you have an image with a lot of distortion and it comes in like that, you can remove it very simply by dragging it.

Sometimes in a rendering we want to add it. And it's strange because this phenomenon, it's not something that's visually interesting but it's the way our brain perceives an image, and our brain is used to looking at photos that have it. We don't really think about it or maybe even notice it, but subconsciously I think our brains will look at it and think, OK, it has that in there and looks more real. So that's barrel distortion.

The next one is chromatic aberration. I don't really like to talk about it too much because I've seen a lot of artists overuse it. It looks nice when it's done correctly, but it's a strange thing.

Basically if you have a cheap lens you'll get a lot of this effect, and what it is, is basically fringing. If you have an image-- this is a digital image-- with some high contrast areas like this tree against a very bright sky, you start to get fringing.

And you can see where the leaves-- we have the cyan and magenta. It's basically the light diffracting in the lens. So it's-- we get fringing.

Now, renderings don't have this because, again, we're not taking-- we're not creating renderings with a real lens, but we can simulate it to simulate reality. So the way we do that, again we go to the Lens Correction. And I'm going to zoom in here so you can see it. I'm going to pull into an area right here that you can really see it.

And there is an area called Chromatic Aberration. And what I do is I'll increase it in one direction, in my red and cyan, and I'll decrease it in the blue and yellow. And you'll see this fringing. You see the color that we get? The red and the blue?

And I overly exaggerate it so you can see the effect. But typically I'll go plus 15 for the red and cyan. I'll go negative 15 in the blue and yellow.

And it's very subtle, but it's enough to make it look realistic. Again, if your client sees it and says, what is that, then I've failed, so--

And then the last one is glares-- lights, blooms, and flares. And lenses pick up on all these things that have bright spots. This is a photo that I took of a sales office we did some renderings for and this is-- actually these are our renderings up on the wall. And I took this picture of my son standing watching these images.

And it just so happened that the pendant light had this flare on it that it looked really nice. It looked natural. It didn't-- we add those into our renderings, and we do that, again, so that our renderings look real.

And there's a way you can do that actually with v-ray-- we use v-ray. And if you turn on the Lens Effects, you have to turn on the bloom and the glare and then hit Render.

Now, the trick with this is it doesn't work if you render and then turn it on. You have to turn them on and then render them.

And what it does-- it's a post effect. So as it renders, it'll finish rendering, and then it'll get all the light information-- it was a 32-bit image. It'll apply it as a post effect.

And what's really nice about that is we can actually create a render element and reapply it to our diffuse image in post. So there you can see the pass and you can basically just overlay it on your diffuse pass in Photoshop. So we have a bloom layer and there's the glare layer. And we can do in Max.

You can also do it in Photoshop. And I like to control a lot of my flares and I guess this is called a flare here. But these are actual, real camera flares. I don't like using the built-in one in Photoshop because it looks really fake.

But basically I take a selection of it and I'll pull it into my rendering. And I'll set it to a blending

mode of Screen and that way all the black goes invisible and anything that's white stays.

So I'll set it to a Screen mode. Here I am labeling it. Labeling is good in Photoshop. So Screen and there it is.

And it's clearly too bright and it's too obvious. So you want to make sure you move it in the right direction. And if you study these in reality, the way flares work is they always have a direction. It's towards the center of your lens.

And so if you have a flare and it's got a streak going in the opposite direction of the center of your image, it's not actually correct. The correct way to do it is to have that long streak going towards the center of your image, and they should all be converging. If you have several flares they should all be converging to the center of your image.

So in this case, I'm adding a Hue Saturation to control the color of it. So if you want an incandescent light, you can make it warmer. If you want a LED light you can make it cooler. And there's a lot more control to do it in Photoshop.

And then I'll control the opacity. Again, if you overdo it and the client looks at it and says, that stands out and it's distracting from your image, then I didn't do my job. And so it's very important that all of these photographic elements are very subtle. You want them to be very subtle.

And the last phenomenon is depth of field. Depth of field is interesting. It's something that it's kind of very kind of fashionable. I like to see a lot of these large bokeh images with a lot of effects and depth of field.

And it has to be done correctly though. And so many times I've seen a rendering where the field of view is very large and it has this really strong depth of field effect. And in reality your camera is not going to quite work that way. Really, the shallower your field of view is, the more of this effect you get.

Now, if you have a very wide angle, remember it goes back to your f-stop. The wider your angle is, the less f-stop you're going to get. And so it can be done incorrectly.

But you can do it in Max. And basically if you select your camera, and with the physical camera-- this is Max 2016-- there is an Enable Depth of Field.

And as soon as you turn it on, you'll see the effect in the viewport. Now, the reason we're not seeing it here is because, again, our aperture. It was too high. And so as soon as I set the aperture down to 1, now we start to get that very long, that big depth of field effect.

And so what's really cool about 3ds Max is the physical camera in Max actually works like a real camera. So the higher your f-stop, the more depth of field you're going to get. The lower your f-stop, the shallower you're going to get and you're going to get that effect.

There are also other features in the camera. And here I scroll down to an area where-- oh, I'm controlling the target distance. And so you can choose areas that you want to focus. And so you can see that the target distance, as it increases I'm increasing the location of the area that I have in focus.

So along with the target distance, you can also control the way that you get those little-- the bokeh effects. And you can turn that on. There's a whole bokeh area.

And you can change them from circular-- it's basically the shape of your aperture-- from circular to bladed. And bladed is the way that-- it basically has like a barn door on your shutter that keeps the light from coming in.

And you can set the number of it in Max. By default it's on 7. And I usually like to do mine at 6, but you can also change the value of the ring. There's a correction, correct bias on it, and you can control the way that that shape is changed. And so you can have it get that strange effect.

If I go back you can see kind of those rings in the foreground, those little circles. They're not perfect circles. They're more transparent in the center. And you can control that in Max with that bias.

Now, this can also be done in Photoshop. You don't have to do depth of field in Max. So in Photoshop, this is my depth layer. And basically I'm pulling it into my channels.

And this is called a z-depth pass for those of you who don't know Max. But we're going to use that z-depth to control our blur.

And so now if we go to Blur, there's a lens blur option. And if you select Lens Blur, you want to make sure that your source is pointing to that z-depth pass.

And in Photoshop you can just click different areas on your image and it'll blur the image. If

you click a certain spot it will keep that spot in focus. The radius affects how much blur you're going to get. And then you have specular highlights.

So as I increase the radius, it'll increase the amount of blur. If I click on the couch, it'll keep it in focus. If I click on the table, it'll put the table in focus.

But doing it in post, it's a little limiting because it's not true depth. You're not really controlling it. And so there are things you can do to get a better simulation.

A lot of times what I'll do is I'll take my z-depth pass and I'll blur it. And I'll just do a very subtle Gaussian blur on it, and that way it'll just blur the edges so I don't get that really strange, solid line between my blurred object and the object that's in focus. And that's what I did here.

Now, the advantage to doing it in post with a z-depth pass is you get instant feedback, instant results. It also renders faster. If you render in Max with depth of field on, it's very slow.

The advantage is that it's a little more accurate. It's a little more correct.

So if you look at these two renderings you can see one was done in Photoshop and the other was rendered in 3ds Max. And even though the rendering itself is noisy-- you can see it's got a little grain on it-- the quality of the depth of field is a lot better. We're getting a lot more control on the blur.

The couch in the foreground, it's much more accurate. It's much more physically accurate. So that's depth of field.

So really in summary these are kind of the keys to your composition-- staging, mood lighting, photographic phenomenon, and these are the phenomenon that we add. And we add these into our renderings and sometimes we don't.

Sometimes we want renderings that are very clean. And sometimes we have clients that say, hey, we're doing an office space and we want it very clean and pristine. We don't want it at those specs.

And so I'm sharing all these to you. It's kind of like Pandora's box. You know, here are all the toys that we add into our renderings. But knowing them, you have to be very responsible with how we add them and be very careful with adding them.

There's another aspect that I wanted to show you, and this is something that we do in our reel.

I showed it in our reel. It's kind of a piece in the end. But we also do some camera tracking.

And this is a piece that we did for a client in Austin. This is a high rise that's going up. It's under construction right now.

And this was a-- you can see the building right here is the one that's white in the middle. This is our 3D model and the rest of it is drone footage. And so we tracked the drone footage and put our 3D model onto it.

And what's interesting about it is the first time that-- you know, we didn't shoot the drone footage. We had someone else shoot it. And what's interesting about it is a lot of times people want to fly drones, the first thing they think of doing is putting a GoPro on it, which is great because you get to see everything.

But the problem with that, with a GoPro lens is it's a very wide-angle lens. It's a fish eye lens. And so we couldn't really accurately track our camera to that, and so we need to go back and use a better camera. We need to use something else.

And so he had an Olympus, a digital SLR, and that's what these were. And they turned out much better because we could actually track the building to it.

Now, for this we actually use a software called Boujou which I showed in the previous class. And I wasn't going to show it here, but I think there was enough interest in how it worked. But so we take our footage, and this is the drone footage, and basically all it is, is an image sequence. There's not much to the footage itself.

But what it does is it'll track points through the footage. So this is a feature tracking. And so what it's doing is finding areas in the image of high contrast and it's basically tracking those pixels with very high contrast areas, and it's going through that whole image.

And still in 2D. There's nothing about these points but except for the contrast and the colors of the pixels.

So once it tracks those, there's a feature that does a camera solve. And so we camera solve it. And you hit camera solve, and basically it turns those 2D tracked points and pixels into 3D information and it actually turns it into 3D space.

And so you can see now all these yellow dots are actually 3D tracked points. It converts all

those mindless 2D points to 3D points in space.

What's great about that is we can now take those 3D points, pull them into 3ds Max, and use that to track our building. And so here what I'm doing is I'm exporting it to a Mac script, and the program will do that. It'll export it to a Mac script.

And there's a scale factor, and because it's an image there is no scale to an image. The points are arbitrary. And so because I know it's a large space, I set it to 100.

So I'll pull my Mac script into 3ds Max. As you can see, the points will come in with the camera, and it comes in with a keyframed camera. And so there's my camera. And they're tracked at a different location.

So you can see the axis is not correct. The way to solve that is to rotate it, and the easiest way to rotate it is to create a dummy object and basically link all the objects to the dummy object. And that way it keeps all the keyframe information. So once it's linked to the dummy, I can simply rotate the dummy.

And the key to making your building stick to the camera track is all those points. The lowest points on your side view have to be at zero.

And so you can see all these points that are at an angle. I have to rotate it until all those points are now on my horizon line right there. So once they're level and flat, I'm going to have a pretty good track.

So now I'm looking through my camera and you can see all the keys at the bottom, and those are all the points from my 2D footage in 3D space. Now, I really don't need the points in 3D. They just tell me this is where the points are from our footage.

But just to make sure that it looks correct, I import my footage into the background just so I can see what it's going to look like. So I bring it in as an image sequence so I can scrub through it in Max.

And to get it to show up in the viewport, you have to turn on environment background. And I set it to Screen so I can see the image.

So there's my footage, and just to make sure that it's going to track correctly I'm going to set my aspect ratio on my camera to the same as the footage. There it is.

So when you scrub through you should-- there are points in there. They're kind of hard to see on the screen, but it's tracking to those points.

Now, what's interesting is you can see my grid as I build an object is arbitrary of those points, right? So even though the camera is tracked, as I build an object-- if you have a building or a car or whatever it is, you have to make sure it's in the correct location.

And so to do that you simply move the camera around until it's in the correct spot. So rather than move the object-- you can move the object, but I'm moving my grid. It looks like I'm moving my grid. I'm moving the camera until it's in the correct location.

In this case it was really easy because I had the roads and the buildings was very-- everything was very orthogonal. And so I could simply just track it to the correct axis and I had that viewport grid that I could line it up to.

So I had the height of those points correct. Now it's just simply rotating the camera so that it was facing the right direction here. So here I select my dummy again, and see I'm just simply shifting it.

And if I want that viewport grid to line up with my buildings, I just rotated it ever so slightly. So I'm going to move it just so it's in the right spot.

So and once it's in the right spot you can have anything in there. The camera's going to track and it'll track around that building. And it seems to work fairly well.

So we do this for a lot of our animations. When we get drone footage we'll track our 3D geometry onto there.

You can apply this to 2D or interiors as well. Do you have interior spaces, you had footage, you could do that as well. You want to put pieces of furniture in your footage, you could do that. And so that's something that's also very doable.

And so we had-- we ended up putting this together just to kind of show what the process is. And we showed this to our client. He said, hey can we have that? We'd like to show that to our clients so they can understand the process. So we took the drone footage and kind of did this composite where they can kind of see what the end result's going to be.

In this case, we used the-- the drone we used was an eight prop. The four prop was a little

jittery. We had a lot of wind up at that height and so we switched from a four propeller to an eight, and it really stabilized things. It made it nice and smooth.

So and the projects still are undergoing. We may end up revising this as they go through, but they're marketing this thing quite a bit so it's all over the place.

So that's pretty much the process of photography for renderings and renderings for photography. And I'm glad you guys can make it. If we have questions, we can open up for questions and answers. I think we have a little under 10 minutes.

And I think there are some microphones lined up here if you have questions that you want to ask, just so that we can pick it up on the live feed. So we don't have any questions? We have one question up here.

AUDIENCE: Do you have a gallery we can review?

RAMY HANNA: The question is do we have a gallery that you can review. Of our work? We do. We have a website. It's right here in fact. Let's see if I can go to it. It's tiltpixel.com and it has a lot of our work on it.

And we do work for lots of different people. We do exteriors, interiors, retail, residential, photography. We have some videos. But it's all architectural. So it's-- our passion is architecture as well as renderings. And so we get a lot of architects and developers that will come with projects like this, so-- are there are any other questions?

AUDIENCE: What kind of camera do you use in the real world?

RAMY HANNA: What kind of camera do I use in the real world? I used to use a Canon and I just recently switched to a Nikon. I have a 800. So and it's a great camera. It's a good camera. In fact,

I just bought a prime lens, a 50, and I almost use that for everything except for doing my architectural. But it's a really nice camera, yeah. A question in the back.

AUDIENCE: Do you shoot in raw and then edit it [INAUDIBLE]?

RAMY HANNA: Do I shoot in raw? I do shoot in raw. I love shooting in raw because then I don't have to take pictures of different exposures, different-- I can basically-- I can take a picture without messing with any of my camera settings, and I can bring it back into Photoshop. A 32-bit image is very forgiving.

I can get some of those tones-- just like that Julius Shulman image, I can take one picture, I can pull the exposure from the inside and keep the exposure from the outside. And so it's-- yeah, raw is great. It's very large, but, yeah, raw is great. Question in the back.

AUDIENCE: As far as a rendering engine, do you prefer v-ray or do you use any others?

RAMY HANNA: The question is what rendering engine do we prefer? We use exclusively v-ray and we really like-- I've tried many. I've worked with mental ray for a long time. I use i-ray for a little while. And I always end up coming back to v-ray.

And I really like v-ray because one because of the support that they have, but it's just so freaking fast. It's really fast.

And so the quality we get out of it is pretty good. It may be a biased rendering engine, but to our eyes, we can't really tell the difference between the biased and the unbiased, and it looks-- for us it looks really good. But it renders really quick which is why we like it, so-- question over here.

AUDIENCE: Are you finding that you're using drones for stills a lot more?

RAMY HANNA: Yes, actually. The question is are we using drones for stills. And the answer is yes. And the reason for that is because just the time of work involved.

Before we used drones, we did a similar building in downtown Austin and we didn't have anything except for maybe Google Earth and I had to remodel basically the whole downtown. I wasn't going to get a helicopter, although sometimes we do helicopter shoots. But it took almost a month for me to model all of downtown Austin and just for one building.

And so it's a lot cheaper to get a drone to go up and shoot one shot. And then I can just put my one building into that shot and make sure that the composition, the lighting, and the-- that looks good. So yeah. We use drones for stills all the time.

AUDIENCE: Makes a lot of sense that you use [INAUDIBLE] to do the light effects and [INAUDIBLE] effects in post for stills. How can you do that in animation?

RAMY HANNA: The same way. So the question is how do we do a lot of the effects in post for animations. We do it the same way. Instead of Photoshop, we'll use After Effects.

And After Effects is just like Photoshop only it's time based. And so anything you can do in Photoshop, you can do in After Effects and you can keyframe it. And rather than rendering out one image like the z-depth pass where it's just a still image, we'll render the sequence out along with our beauty pass and along with everything else.

And we can control that and we can even keyframe it. So if we want the depth of field to look like this at frame 1 and then at frame 200 like this, it'll keyframe and yeah. It works really great.

AUDIENCE: Do you guys make use of remote rendering?

RAMY HANNA: Remote rendering. So we have done some-- in fact, I am doing some testing with rendering on the cloud. And we are doing all of our rendering locally right now. So and I think even after doing the testing we're going to keep everything in-house. It's just so much faster for us.

I've found that the time it takes to upload our model is about the same amount of time it takes for us to render it internally. So by the time it's done rendering, I've just uploaded it to the cloud. So it's not that we have a problem with our information getting out there. It's just the speed. So I have no problem spending the money on a local render farm internally.

AUDIENCE: The software that you use to track the drone footage?

RAMY HANNA: The software used to track is called Boujou and it's made by VICON. And it's a very small software. It's not much of what it does, but it does a really good job. And I think After Effects does it, but Boujou does a great job. Think we have time for a couple more questions.

AUDIENCE: [INAUDIBLE] a quality [INAUDIBLE] Photoshop and Lightroom?

RAMY HANNA: Is there a difference between doing the post work in Photoshop versus Lightroom? In some things there are. I haven't worked with Lightroom a lot, but I would say for the most part the--

I mean, they're both Adobe. They use a lot of the same algorithms. They're not much different. And so if you're using the same effects in Photoshop, it's probably the same algorithm that's working for Lightroom.

AUDIENCE: It's a lot easier in Lightroom.

RAMY HANNA: Yeah.

AUDIENCE: [INAUDIBLE] or touch up, it's a lot easier to [INAUDIBLE].

RAMY HANNA: I would say Lightroom for photographers, it is a lot easier. It's more direct. And Photoshop, you have the layer aspect. But for the most part, the end result is the same quality of image, yeah. We have time for one more question.

AUDIENCE: Two-fold. So what's the difference in rendering time for v-ray versus mental ray? And then what do your light scenes look like? Like how many lights will you typically have in an animation?

RAMY HANNA: That's a good question. So the first question is the time difference between v-ray and mental ray. And we found that they're actually apples to apples. If we have the same number of lights, v-ray is much faster.

In fact, I had one-- what made me go back to it was I worked in mental ray because it was free. It came with Max, so I worked with mental ray for years. And then I had done v-ray previously for awhile.

But the advantage to v-ray was I had this one scene and it was taking 30 minutes in mental ray and I said, you know what, I'm just going to switch everything to v-ray. And it ate up the shot in 10 minutes. So what was 30 minutes in mental ray is much faster in v-ray.

And I think that's my experience, but I have-- nothing against mental ray. It's a great rendering engine. But for Max, for what we do, it's v-ray.

And then the second question is how many lights we have in our scene. We try to keep our lights as accurate as possible. For example, like a room like this, we'll try to put lights where every can that's on is. If there's a spotlight, we'll put a light where that spotlight is.

And the problem with doing that is it's not-- you find that when you render it it's not quite enough. There's another factor is the exposure camera settings. So got to make sure that your camera settings are correct.

So for a room like this, you'll want a very high exposure, probably I don't know, 30, 1/20 of a second shutter speed. And so you want those factors to be correct.

But then after you have all those in the right place, if it's still not enough, we will simply create planes in the scene to simulate the illumination. So--

AUDIENCE: Use FBX?

RAMY HANNA: Say that again.

AUDIENCE: Do you use FBX?

RAMY HANNA: FBX? We do use FBX. We use FBX to get Revit files from architects.

AUDIENCE: How much stuff do you need to have in touch up and?

RAMY HANNA: Yeah, how much do we have to touch up? There's quite a bit of touch up with FBX. The nice thing about the FBX is it takes the Revit model and all the Revit links and brings it in as one nice little package. And the architect doesn't have to think about all the links that are out there.

The problem with the FBX is it tessellates geometry like crazy. And so if you have especially railings, anything that's curved, the tessellation on it is ridiculous.

And so what we found is it's much better to import as DWG. And so we'll ask architects to export the Revit models a 3D DWG. We find that's much, much better. The file sizes are much smaller. And so DWG is really good.

Revit importing is good. It's getting better. It's gotten a lot better. But I prefer Revit importing to FBX. But, yeah, we work with all of them.

AUDIENCE: [INAUDIBLE] like the materials?

RAMY HANNA: The materials with DWG-- it doesn't come in with materials, but you can bring it in with-- depending on how it's modeled in Revit, you can bring it in based on components and by material, not necessarily with the material. But we're going to reapply the materials anyways. And so if it comes in as an FBX and we have an architectural shader material on it, we're going to change it anyways to our v-ray shaders.

So I think that's all the time we have. Is that right? We Good? OK, well, thank you so much for coming to my class.