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PROFESSOR: So this is Josh and John. They're both from Planet Nutshell. Josh is the founder and John is an animator?

JOHN MCGOWAN: Yes.

PROFESSOR: And they're going to talk today about storyboarding and continuing our discussion on visual storytelling. I'm super excited about today's session. It's going to be a lot of not only lecture, but workshopping some of the scripts and ideas that you guys have been thinking about so far. Anything else?

Oh! Josh's background is in creative writing. So you can also get feedback from him on your scripts. And they make short explainer videos that engage people, not only in disseminating information, but entertaining them as well.

JOSHUA GUNN: Yeah. So we in lot of ways do many of the things that, I mean, I guess directly that you guys are working on. So this is a good fit for us to be talking to you.

So, yeah. So my job is to sort of rally all of the people who work at Planet Nutshell in interesting, creative directions. And John is a really talented illustrator and animator. And he also does our storyboard artwork.

So today, after I give a brief little talk about animation and storyboarding, we'd like to just open things up and share with you a script that we produced a while ago. And we'll all storyboard it together. And I would love to see what we come up with.

We've produced this script, but what's really great about what we do is there's no one right way to do it. So what will be interesting is to see what we come up with collectively here. As opposed to what we produced.

And I have looked at your scripts, the things that you're working on. They're all really interesting. So I would like to open things up to any questions you have about what you're working on a little later.

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And yeah, I write a lot of scripts. So if you need help with that, I'm very willing to give you any guidance I can. So I'll get started with this short lecture portion. Somebody made this spinning thing for you guys today. We thought that would be a nice touch. Ding!

All right. Let's see. Yeah, so we're going to talk about animation and storyboarding. And specifically, animation in the context of what you guys are doing. I mean, animation is a huge topic. I'm not going to talk about techniques or theory or any of that kind of stuff.

But I do want to talk about when it's a good idea to use it maybe in your own work. And there may be more reasons why it might be good. But these are the ones that I came up with for today.

So animation is good when synthesizing, reinforcing, or recapping information in a simple, visual way. Cows plus farts equals global warming. So taking abstract ideas or summarizing information and presenting it very simply is something that animation is really good at.

So when thinking about developing your own scripts, you can think about moments where the visual story could be augmented with some sort of encapsulation or summary that is worthy of animation. And here's one that's pretty obvious. The subject cannot be seen, it's microscopic, cosmic, or theoretical and abstract.

So those are often good times to think about animation. And we have some examples of where this sort of thing is employed later.

John came up with this one. Actually, John helped with all these. Because I was really busy this week. So I really appreciate it. Footage is not easily attainable. So say you want to do a video about-- well, in your case, you know you're doing navel engineering.

Maybe you want to shoot something about, like, the bottom of the ship. Or something, you're going to have to hire a team of scuba divers to get down there and shoot the hull of the ship. So that might be a nice opportunity for visualization that can't be attained through live action.

And kind of the catch-all category is that animation adds visual engagement. The story is somehow made better by using it. And that's sort of an abstract, subjective thing to say. But I think the best way to demonstrate that is just to show examples. Which I'll do in a bit.

So animation is sort of silly or not a great choice-- we use this term a lot. Like, is this eye

candy, or is this really a functional part of the story? Again, is it eye candy or is the story made better?

So just using animation because it's cool or it's neat can actually distance the viewer and disengage them from the experience. Because, I don't know if you guys watch-- you know, you've seen a movie like Transformers. Or, god, what are some of these ridiculously visually opulent movies, you know?

And a lot of times when I watch those sorts of things, I begin to emotionally disengaged from them. Because all I'm doing is being bombarded by visual information. There's no story that's really compelling or engaging me. So that's something to think about.

Live action is really great that at a number of things. And these are some of the things I came up with. The notion of personality, the human face, the human experience. The host, is Elizabeth talked about on Monday.

Location, creating-- animation can create a lot of interesting locations. But why would you draw the MIT campus when you have it right in front of you, for instance? And again, the notion of human interaction. Humans talking to each other and engaging with each other is something that live action is really good at.

And the final, catch-all category is you just can't think of anything better to do. So, oh, I'm just going to animate that part. I don't really want to think about how I'm going to present this. So I'm just going to do some animation.

And that's not the best choice. You should be making choices based on what the strengths of animation are and the strength of live action.

PROFESSOR:

And just to add to that, that's also the easiest choice to make. And the one that happens most often. Or the one that happened most often when we were making seasons one and two is that we'd hit a point in the script that looks a little bit complex in terms of visual execution.

And we'd say, well, what are you going to do here? And the host or the cast would say, oh, well, we're just going to animate it. As if, like, that was going to solve all their problems.

And I think that these points may sound pretty reasonable and obvious. But it's very, very hard to thoughtfully integrate that into your visual script. So I really encourage you guys to think about especially the third point, not defaulting to animation because you don't want to figure

out how to visually integrate your script into the video.

JOSHUA GUNN: Yeah. OK, so here are some examples of videos that integrate both live action and animation. There are many examples. I thought these were especially strong ones.

I don't know what you guys-- you're going to talk more about how you made this one. But the composition of this one works. It was obviously designed around position of the live action character and the animated elements.

Who has seen this *Story of Stuff* series? It's quite interesting.

PROFESSOR: Do you want to play just a little of it?

JOSHUA GUNN: Yeah, I'll play a little bit of it.

FEMALE So next, the--

SPEAKER:

Do you have one of these? I got a little obsessed with mine. In fact, I got a little obsessed with all my stuff. Have you ever wondered where all the stuff we buy comes from? And where it goes when we throw it out? I couldn't stop wondering about that.

So I looked it up. And what the textbook said is that stuff moves through a system. From extraction, to production, to distribution, to consumption, to disposal. All together, it's called the materials economy.

Well, I looked into it a little bit more. In fact, I spent 10 years traveling the world, tracking where our stuff comes from and where it goes. And you know what I found out? That is not the whole story. There is a lot missing from this explanation.

For one thing, this system looks like it's fine. No problem! But the truth is it's a system in crisis.

JOSHUA GUNN: Just a storytelling component there that I really like is you may already sort of know-- we talked it about on Monday. Here's a paradigm or here's a situation that you probably already understand, but hang on. There's a problem. There's more complexity here than you ever could have imagined. And I'm going to tell you about it. And that is a really cool storytelling component on top of the integration of animation and live action.

FEMALE An the reason it's a system in crisis is it's a linear system. And we live on a finite planet. And

SPEAKER: you cannot run a linear system on a finite planet indefinitely. Every step along the way, this system is interacting with the real world.

In real life, it's not happening on a blank white page. It's interacting with societies, cultures, economies, the environment. And all along the way, it's bumping up against limits. Limits we don't see here because the diagram is incomplete.

So let's go back through. Let's fill in some of the blanks and see what's missing. Well, one of the most important things it's missing is people. Yes, people! People live and work all along this system.

And some people in this system matter a little more than others. Some have a little more say.

JOSHUA GUNN: OK, so you get the idea. I mean, it's a long video. But I think it retains engagement because of the quality of the writing. And because of the interest that's created from the art work. I encourage you to watch the whole thing if you get a chance.

Let's see--

PROFESSOR: [INAUDIBLE] all of the videos that Josh is going to play today are on the syllabus.

JOSHUA GUNN: Oh, OK. Cool. You mind if I play some of this? Or have you guys already seen this video?

PROFESSOR: I've got a little clip of the portion that I'm going to talk about, but you can play it.

JOSHUA GUNN: OK, I'll just play the beginning. This has George in it, who I assume you saw yesterday.

MALE SPEAKER: You know what's more like life than a box of chocolates? Farts. You really never know what you're going to get. Skunk, rotten eggs, garbage dumpster? The possibilities are, unfortunately, endless.

But why do we fart? And how does your body make so many different smells? The answer is fermentation.

This is a giant bioreactor. It's also called a fermenter. And in here, a fungus known as brewer's yeast is transforming water and dead plants to beer.

So you know that thing where you eat food and breathe in oxygen to get your energy? That's called respiration. Yeast also need to get energy from food, but there's no oxygen in those tanks. So they have to use a different process called fermentation.

Now, both your cells and yeast cells break food down to get energy. But your main byproducts are carbon dioxide and water. And yeasts main byproducts are carbon dioxide and alcohol. That's how this stuff gets to be beer.

JOSHUA GUNN: OK, I think that-- similar concept, the integration of animation and live action. And the way that the animation somehow augments or improves your understanding of what he's talking about.

So let's see. So let's switch back here. So that's a very brief overview of how you can use animation in your own work. How to do it, technically and artistically is another matter. I'm happy to talk about that separately.

I don't know how much training is in this course for animation.

PROFESSOR: Not whole lot. We do have the equipment if you want to learn more. We have about 10 of these similar tablets if you guys are interested in learning about this. But we're not going to go super in depth.

JOSHUA GUNN: Yeah, this might be an opportunity for you to talk about that segment that you did. And from what I understand, the animation that you do is fairly rudimentary. And very effective. And it might be something that these guys could pull off.

PROFESSOR: All right, so I'm going to talk a little bit about one of the scenes from the farts video. This was actually something that George was going to talk about yesterday in his script writing workshop. So this will tie in pretty nicely if I can get this to work.

All right, so take a second to read this passage. So when you were writing the farts script, this was a piece of information that George had come across. Which he found very fascinating. It was one of the shareable facts that he latched onto. The fact that the microbial population in your gut is about 10 times greater than all the somatic germ cells in your body.

Now if he had said this line in the video it would've been a disaster, right? But what is this passage essentially saying? Does anyone want to take a guess?

AUDIENCE: [INAUDIBLE]

PROFESSOR: Not just that. So somatic and germ cells basically refers to all of your human cells.

AUDIENCE: There's more stuff that's not you in you than there is pieces of you.

PROFESSOR: Yeah, yeah basically.

AUDIENCE: Mostly [INAUDIBLE].

PROFESSOR: Right, right. So the way George decided to distill this down there 10 times as many microbes living in your gut as there are human cells in your body. I mean, that's basically what this entire passage taken from a journal article is saying.

But the problem with saying just this is that, at least for me and for George, one of the questions that we thought of as an audience member was well, how does that exactly work? Like, how can you fit 10 times as many bacteria in you, yet you're not walking around just oozing bacterial cells completely outside of your body.

Because I think a misconception that people often have is that they're the same size, right? So it was kind of this paradox that wasn't essential to the story of the video to explain, yet was a potential point of confusion.

So this was a reason why we decided to use an animation in this particular spot. Because As Josh was saying earlier, we felt like the story needed to be clarified. We felt like the story needed to be advanced a little bit.

But we also felt like if we took the time to say there are 10 times as many microbes in your gut as there are human cells in your body. Which doesn't make sense, because you would think that you'd be oozing out bacteria, but it actually is fine because bacteria are a lot smaller than human cells, right?

That actually is, like, two or three seconds of very, very precious time wasted. And sort of loses the momentum of the video. So we decided to do an animation to explain all of that instead.

So what we did was we had shot everything without the animations. And our storyboarding process is incredibly janky. But it essentially works. And hopefully after today your storyboards will be a lot better than the one we used.

But what I literally did was I got the rough cut of the video. And I got all of the footage. And I specifically was looking at this portion of the video where this animation would need to go. And I took screenshots of the video at various time points where I knew the information needed to go.

So this is setting the line in context of the section that he was delivering. So the first line [INAUDIBLE] that we carry a fermenter right here with us in our gut. And this was the still that he said that, so I was telling the editor, at this point I want a fermenter to show up. And he actually motions during the scene.

And then there was this second line, "Except instead yeast, my gut uses gut bacteria." So I was trying to convey to the editor to take my drawing of the yeast and swap it out for drawing of a bacteria.

Again, this is incredibly rudimentary. You don't have to be an amazing artist to pull off the clarity that you need for a storyboard.

Then he says, "A lot of them," and I wanted a ton of bacteria to show up. And then we get to the line, "There are 10 times as many gut bacteria as there are human cells in your body." At which point I wanted lots of bacteria to show up and then show it in comparison to the human cell.

This was going to be the key frame to explain the concept of how you can have so many bacteria without oozing it outside of your body. So essentially we were explaining the whole difference in scale through one frame.

JOSHUA GUNN: This reminds me a bit of the flipping cat video we saw on Monday. And there's a segment in that video that I think is kind of weak. Where he is explaining a lot of technical information. I just didn't absorb it. I couldn't follow it. And I was thinking, you know, this would have been a lot better if he'd maybe done some better script writing. But also maybe some animation, you know?

I think animation can be really good at moments like these when you've got this sophisticated or complex information and you need to maintain engagement with the viewer. But also encapsulate it.

Yeah, anyway, sorry to highjack.

PROFESSOR: No, no, no. That's fine. [INAUDIBLE].

And then the whole way we wrap up that scene is he explains that instead of just one species of yeast like they use when you brew beer-- that's the whole reason why we were at the

brewery-- my gut uses hundreds.

And if we just had that text, I think that it would bring up a lot of questions or maybe points of clarification for the viewer that, again, we just didn't have the time to explain in the script.

Which is why we relied on the animation to do it for us.

So John's going to show you some animations that are awesome and very artistic. For our animations, I literally just take a Sharpie and a piece of paper, and I draw out the doodles.

JOHN MCGOWAN: They're nice!

PROFESSOR: Thank you! But it's nothing crazy. And I basically scan them in to our editor and had named each picture. And then in the storyboard I had explained, OK, here's my drawing of the fermenter. Please refer to fermenter.jpeg for the image I want you to use.

And then he went into After Effects and inverted all of the drawings and moved them around.

And I think you're going to talk about After Effects just a little bit.

JOHN MCGOWAN: We can talk about After Effects.

PROFESSOR: OK. And again, if you want to play with any of this on your own, there are really good tutorials on Lynda.com. And as MIT students, you guys have free access to the entire library. So if you want a tutorial on how to use After Effects, which you all have access to as well if you're interested. You can just come talk to me during class.

So we storyboarded everything out. And then I drew the doodles. And the key frame here was this picture that sort of explains the whole concept of how so many bacteria can fit inside of you.

But it just takes one picture instead of 10 words. So this is what that scene ended up looking like.

MALE SPEAKER: Weird. Turns out, we all carry a fermenter with us right here in our gut. Except instead of yeast, my guy uses bacteria, and a lot of them. There are 10 times as many bacteria in my intestine as there are human cells in my entire body.

And instead of just one species, my gut uses--

PROFESSOR: My gut uses hundreds. Sorry, it got cut off. So, I mean, there are many ways that we could

have done that. Like Josh was saying, there's no right way when it comes to animations, when it comes to video in general.

But this was sort of our way of working around the problem of not having access to the footage of real bacteria necessarily. It was just a world that we couldn't access, or didn't have time to access, or would have been too distracting to access in this video.

The other thing I wanted to mention really quickly before Josh continues is when we shot, we shot knowing that we were going to do the animation overlay in mind. You may not know that ahead of time.

So what I would suggest, if you're interested in doing something like this, is to shoot thinking that you're not going to do an animation overlay. And then just do another take. Just in case you want to do something like this.

So the way we framed the shot, we tried to make sure that the background was dark enough to where the animations could appear. This is not an ideal framing in a not an ideal background. So I'm sorry to use this as an example. This is probably one that we could have improved.

But I'll show you another one.

**FEMALE
SPEAKER:**

These small molecules are called metabolites. Just like how all the DNA in an organism forms the genome, all of the metabolites form the metabolome. Even though each metabolite can be made from only six elements, there are so many possibilities that it would take scientists thousands of years to make each one and figure out--

PROFESSOR:

And figure out its usefulness. So we had the exact same storyboarding process to create this. But when we shot Anastasia that day I knew that this is what I wanted to do for that scene.

So we told her to go like this with her hand. And we were like, we're going to put stuff there, don't worry. And we framed her wide enough. And we gave her enough grass space outside of her that we could fit some of these animations in. So just anticipating that-- and I can talk more about this tomorrow, when I talk about producing-- is a good thing to do if you want to do animations. And I'll show you one last.

FEMALE

Those animals get eaten by slightly bigger animals, which get eaten by slightly bigger animals.

SPEAKER: Which get eaten by animals at the top of the food chain. Animals like us.

PROFESSOR: So that's the raw footage from our video on engineering river cleanups. And again, this is a spot that we knew we wanted to do an animation there. So we framed her in such a way that there is enough background space to accommodate for the animation.

And we actually told her, OK, we're going to put fish along here in post. So pretend like you're looking at stuff, point to them as if there are going to be fish there eventually.

I think we also did it take where we just had her delivering it normally. So we had her framed with not as much extra space behind her. Just in case we weren't going to use that animation. But again, sort of anticipating using that if you need.

So this is what the final scene looked like.

FEMALE SPEAKER: Those animals get eaten by slightly bigger animals. Which get eaten by slightly bigger animals, which get eaten by animals at the top of the food chain. Animals like us.

PROFESSOR: So again, it wasn't incredibly vital to have these animations. One of the reasons why we did use it is that, in the context of the video-- which I'm going to show tomorrow-- we felt like the visual interest was getting a little bit static. So we used animation to move the story forward in that we felt like it was getting a little visually monotonous by the time this hit.

And the other thing is the food web stuff is OK to explain. I think that if you didn't have the animation it would still be OK. But it just added I guess a little moment of whimsy to it. And so that was sort of our justification of putting it there.

So I just wanted to show you guys those examples. And Josh, you can continue on.

JOSHUA GUNN: OK! I can switch here.

PROFESSOR: Yep.

JOSHUA GUNN: When John is helping us out with the workshopping portion, he can show you some projects in After Effects. I don't think After Effects-- it's a complex program with a lot of capability. But I think some basic compositing like this would be quite easy in it.

So we can show you some of those, just some basics about After Effects.