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**Exploring New Worlds  
Life Science Visualization on the Dome**

Presented by

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## **Life Science Visualization...**

**Full domes have historically been developed for astronomy visualizations. This presentation has been developed to communicate awareness - as to how effectively and dramatically immersive full domes, and the associated 3D content, is shaping a brand new era of life science visualization for education, promotion and entertainment.**

Hello everyone. Welcome to Philadelphia. I'm Cory Resh, Partner & Creative Director at 3FX.

So who am I to be invited to speak with you? Way back in 1981, and thanks to the movie Tron, I changed careers from Graphic Designer to 3D Animator. Anyone remember Tron? That was back at the conception of the computer animation revolution.

I'm amazed at how far 3D animation and visual effects has evolved over 27 years... And pleased to have been a part of its emergence, as well as its continuing evolution.

### **A Quick Bit About Our Company...**

3FX is a full service 3D animation facility focused on creating and producing 3D Life Science Animation & Visual Effects.

Our clients are a combination of Pharmaceutical & Biotechnology companies, Medical Device, Healthcare Agencies and others involved in medical education and communication. Our work spans the gamut of healthcare visual needs, from promotional to educational, and for every type of display method.

Although our typical work is what we call "flat-screen" presentations, our clients constantly express the desire to use new and evolving technologies to attract and engage viewers. And as a leading edge company, we are constantly implementing these technologies to enhance the visual presence of our clients.

As medical/life science animation specialists providing views of anatomy, cellular and molecular processes, developing full dome projects for our Immersive Theater Experience™ was a natural evolution. We see a very exciting future for this format!

Both creatively & technically, producing dome content is very different than developing flat-screen productions. When done properly, the results can be very dramatic by comparison. I mean look at all the space we have! Using that space to your advantage presents several unique challenges. The first challenge is to design the visuals so that they not only fill this huge space, but make it an experience.

### **The Visual Plan...**

- Take the viewers on a journey throughout the entire space, not just the forward view
- Move their view to multiple areas, enhancing the immersive feel
- Surprise them with unexpected events
- Excite them with dynamic movements
- Make them feel as though they are a part of the scene, not just watching
- Ensure that the clients specific messaging is enhanced by the drama

This should be an experience. And it all starts here at the planning stage.

### **Storyboards...**

Now, take all those plans and ideas and put them into a visual format - Storyboards. As this is the first time anyone will actually see the intended flow, we go through many pencil sketched revisions and alterations before we are satisfied.

### **3D Models...**

OK, we now have a well devised and laid out plan. Next, full and complete 3D models need to be created. Everything. Not just the environment. But every minute detail. That includes human figures, anatomy, organs, tissues, various cellular and molecular elements, proteins, antibodies, receptors, mitochondria, DNA. I could go on and on.

You'd be amazed at the vast complexities working in combination to keep you alive and functioning. Once they're modeled... they all have to be animated. So we "rig" the characters so that they can have their own internal motions. We use a lot of character animation techniques to get organic, life-like motion. Every object within the scene must have some type of individual motion. We are creating scenes of living things, and everything has a life of its own.

### **Developing a look...**

How do you want everything to look? Realistic? Stylized? Natural organic colors, or vibrant and rich? Every object needs to be colorized, textured, mapped, shaded, bumped, warped, and a slew of other useful techniques that add incredible rich detail.

We research medical texts, illustrations, photographs, scans, and anything else available so that we can be as accurate as possible. And sometimes, we collaborate with the medical researchers to create worlds and objects still unknown. This takes a skillful blend of science and art to fashion an accurate and creative scene.

And because much of what we create is organic, a lot of our work is textured with images of nature. We're the strange people taking close-up photos of sand, clouds, rocks, the veins of a fall leaf, wood grain, the rind of a cantaloupe (always a favorite!), and other things from nature that many people never stop to notice.

### **Animation...**

Animation is Next - and there are all kinds of animation...

- Camera moves to define the flow and overall movement
- The interactions between the main characters
- Surface transparency to reveal inner structures and forms
- Dynamic camera transitions between various environments
- Texture and color animation that shows changes in activity levels
- Shape changes - cells go through many forms throughout their lives
- Roller-coaster rides through vessels and arteries
- The focus and depth of field of the camera
- Macro to micro level zooms for extreme close-ups
- Fly-overs along organic terrains
- Morphs and warps to make things come alive
- Lighting changes to reflect mood and intensity
- Particle systems to generate swarms of characters

All these, and probably more, are critical to developing a dynamic presentation. Each scene will go through several animation "passes" to review and refine the motions.

Once you get into the animation process, other ideas form, you begin to see what's possible and begin to experiment. We stick to the overall plan, but we never lock ourselves in.

Animation, just as in life sciences, is an evolving series of processes.

### **Lighting...**

The entire space needs to be lit so that the environment looks big and endless - while still keeping everything visible. This is really an art. A good animator becomes great when he can light well. Lighting plays a key role - and can be used to change the mood and tone of a scene. Subliminal to the viewer, but very effective.

### **Rendering for Dome...**

Rendering is something all together different. Not only is it in a round, Polar format, it's also huge! Let me give you some sense of scale. Standard resolution used to be 720 pixels by 486 pixels. This was increased to 1280 x 720 for widescreen. True High-definition is 1920 x 1080. A full dome is 4k resolution, or 4000 x 4000.

There are 30 frames (individual images) in one second, and our typical 2-5 minute per frame flat-screen renders jump to 20-45 minutes/frame, and very often more depending on scene complexity, when rendering for dome.

Let me put that in perspective. We very often do 3-minute presentations at the 1080 resolution. That's 5400 frames X 5 minutes per frame = 450 hours of rendering. With our render farm, we crank that out in 1-2 days.

But with dome, 5400 frames X even just 30 minutes a frame = 2700 hours of rendering. That's 112 days - 24 hours a day. Our render farm is fast, but you're still talking about weeks of number crunching.

And remember, we've been talking about 3 minutes worth of visuals. Just imagine what the calculations would be for 30, or even 60 minutes of full dome content!

So for efficiency and cost-savings, we render everything at a much lower resolution, and test it in our dome to see how everything works. Once we're satisfied... really satisfied... we go to the full size render. Our rendering farm runs constantly.

### **Music & Sound Effects...**

Music and sound effects in "Surround" sound. All orchestrated and synched with the animation to help move the viewer around the space. Sound provides extra emotions that help enhance the visuals. And makes it all come alive.

### **The Edit...**

Then the processes of image manipulation, compositing, adding visual effects, editing, and final format output happens. This all requires the fastest data transfer and huge amounts of hard drive storage space. Never enough Terabytes.

Not so far back in 1990, I thought our first 9 GIG drive would be all the storage we'd ever need. How wrong I was! Oh, and those 9 gigs cost us \$3,600! Wow, how times have changed. But the amazing results that can be achieved within a full dome environment are well worth all the effort.

### **Immerse Viewers in Other Worlds Unknown...**

Show them educational and creative visuals in a beautiful story. Give them an experience they will always remember. Anything less is just another movie theater.

Imagine, becoming a part of the miraculous workings of the human body. Explore macro views of anatomy, organs and body systems, to cellular interactions and processes, to molecular worlds unseen by most.

Our clients are utilizing this technology to educate both physicians and patients of their medical advancements and disease states. The general population is educating themselves about their health at a level never seen before. I Googled "Health Information" and got 79 million results. Just last week, Med Ad News announced that the majority of medical information being accessed today comes from the internet, rather than from doctors.

Several cable channels devote large portions of their programming to not only health, but in all areas of science and technology. We see Life Science scenes in product commercials. And I've even enjoyed the WebMD sports injury animations during the baseball playoffs.

The general public is taking a concerted interest in their health. Older baby boomers educate themselves on their specific health issues. The younger, "media savvy" generations are growing up needing, and buying, the latest visual displays.

Expectations are high for interesting science visualizations shown in new and innovative ways, and we are noting an increasing amount of domes popping up in life science centers and even schools.

Constantly bombarded with the multitude of flat-screen visuals we see in our daily lives, there is a constant demand for new visual display technologies to capture audience attention.

3D animated full dome presentations have the ability to capture these audiences by presenting a variety of visual experiences. I come from the world of 3D animation for Life sciences. We're always learning of the millions of processes going on within our bodies. It's as complex and intricate as the world we see around us. But 3D animation can create anything. Real or imagined.

Our group has always been one that stays current with new technologies. Full dome visuals have quickly become a growing part of what we offer. There is a huge and growing interest in life sciences. We've grown a successful company with it.

Sciences of all kinds can be explored as well. Educating large groups in an exciting format such as these digital domes provides positive and exciting opportunities for us all.

Thank you all very much. We hope you are enjoying our city.

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