Ken Museth
A Career Shaped by Creativity

Ken Museth is currently the supervisor and principal engineer of Research and Development in visual effects (R&D FX) at DreamWorks Animation. In between the time he spends engaging in motorcycling as a hobby, and his recent major project work on OpenVDB (an open source C++ library geared toward applications typical of feature film production), we asked Museth to share his views on how creativity shaped his professional development as a computer scientist.

An interesting fact about him is despite today being a widely published scientist in computer graphics, Museth didn't begin his post graduate career in computer science. "The first part of my career path is very convoluted, in the sense that I have a Ph.D. in quantum physics. It started out as a very traditional career move," he explained. One day, during his postdoc in physics at Caltech, NASA approached him. They were developing new techniques for space mission design, and they needed someone to help them visualize complex trajectories living in a high-dimensional space, called interstellar superhighways.

"I had never done computer graphics at that point. I loved working on that project so much, that I asked my colleagues at the Jet Propulsion Laboratory how I could keep doing it for a living. Almost over night, I switched from physics to computer science, and spent the next almost five years trying to move track and introduce myself to the field," he recalled.

When I asked him what the driving force behind his sudden field change had been, he quoted a broader scope and the ease to express creativity. "Quantum physics can be somewhat narrow. What I discovered about computer science and graphics is that it appeals to many people: There is a visual component, and it is applicable to many fields." He later pursued this new passion by becoming a professor in computer graphics in Sweden, and started innovating in the field by reaping his multidisciplinary background and working on highly mathematical problems that had a bias toward physics: "One of the techniques that I was working on when I started computer graphics is called level sets. It attracted me because I was comfortable with the math, but also because it was applicable in a lot of computer science problems." His later insightful work on level sets led to breakthroughs in the development of compact data structures for volumetric systems.

It was the same appeal of creativity that led Museth into computer graphics, which eventually made him leave academia and join the movie industry. "What I discovered while working with computer graphics in the movie industry is that, unlike the academia, you are surrounded by a lot of problems that are screaming at you all the time, and you can just pick. Sometimes you can publish your work, and sometimes you can't, but the driving motivation is not that you need to publish—it's just solving problems. You're very close to the real problems and to the users, and immediate feedback can be very gratifying."

Museth speaks very highly of the stimulating environment he encountered at DreamWorks. "I'd never been in an environment before, where I was surrounded by so many creative people. I'd been blessed with meeting a lot of smart people at Caltech, but we were all the same: all academics, all computer scientists, all physicists."

In describing his working environment, he shared the following: "For a person like me, coming from a very traditional background in physics, working with artists felt extremely enjoyable, and I learned a lot. I collaborated with Michael Clive on fracturing in 'The Mummy' movies, and on some fluid effects in 'Pirates of the Caribbean,' and I felt that my brain was exploding when exposed to him. I've met many people like him, whose are very talented and have no boundaries." He also said after working with artists, the most important thing he learned was not to make assumptions about the tools he develops would be used for. "One example I have is with a colleague who showed me an effect on 'The Mummy' movie. I asked him how he had done it. He said he had taken the viscosity parameter in my tool and set it to negative. I told him that was a bug, because negative viscosity doesn't exist, but it turns out that it had some interesting numerical properties, which created a unique effect, and that's what he was after," he said, confessing that he has since stopped putting safeguards in some of the tools he develops.

Looking back on his work, Museth can't help but acknowledge how creativity fuelled his professional passion. The advice he gives to any aspiring computer science graduate student flows naturally from his experience: "I think it is very important that we acknowledge the fantasies and adventures that drive us, totally engage in them, and try to outlive them one way or another."