

# SIGGRAPH 2010 Course: Physically-Based Shading Models in Film and Game Production

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## Course Description

Physically grounded shading models have been known for many years, but they have only recently started to replace the "ad-hoc" models in common use for both film and game production. Compared to "ad-hoc" models, which require laborious tweaking to produce high-quality images, physically-based, energy-conserving shading models easily create materials that hold up under a variety of lighting environments. These advantages apply to both photorealistic and stylized scenes, and to game development as well as production of CG animation and computer VFX. Surprisingly, physically-based models are not more difficult to implement or evaluate than the traditional "ad-hoc" ones.

This course begins with a short explanation of the physics of light-matter interaction and how it is expressed in simple shading models. Then several speakers discuss specific examples of how shading models have been used in film and game production. In each case, the advantages of the new models are demonstrated, and drawbacks or issues arising from their usage are discussed. The course also includes descriptions of specific production techniques related to physically-based shading.

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## Syllabus

### July 25 (Sunday) 2:00pm—5:15pm, Room 502B

- 2:00: Background: Physically-Based Shading (Naty Hoffman) [\[slides\]](#) [\[course notes\]](#)
- 2:30: Practical Implementation of Physically-Based Shading Models at tri-Ace (Yoshiharu Gotanda) [\[slides\]](#) [\[course notes\]](#)
- 3:00: Crafting Physically Motivated Shading Models for Game Development (Naty Hoffman) [\[slides\]](#) [\[course notes\]](#)
- 3:30: *Break*
- 3:45: Terminators and Iron Men: Image-Based Lighting and Physical Shading at ILM (Ben Snow) [\[slides\]](#) [\[course notes\]](#)
- 4:30: Faster Photorealism in Wonderland: Physically-Based Shading and Lighting at

Sony Pictures Imageworks (Adam Martinez) [\[course notes\]](#)

5:00: Conclusion, Q&A (Yoshiharu Gotanda, Naty Hoffman, Adam Martinez)

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## Organizer and Presenter

**Naty Hoffman** is a Technical Director at Activision Studio Central, where he assists Activision's worldwide studios with graphics research and development. Prior to joining Activision in 2008, Naty worked for two years on *God of War III* at SCEA Santa Monica Studio. Naty has also worked at Naughty Dog (where he had an instrumental role in the development of the ICE libraries for first-party PS3 developers), at Westwood Studios (where he was graphics lead on *Earth and Beyond*) and at Intel as a microprocessor architect, assisting in the definition of the SSE and SSE2 instruction set extensions.

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## Presenters

**Yoshiharu Gotanda** is the CEO and CTO of tri-Ace, Inc, which is a game development studio in Japan.

**Adam Martinez** is a Computer Graphics supervisor for Sony Pictures Imageworks and a member of the Shading Department, which oversees all aspects of shader writing and production rendering at Imageworks. He is a pipeline developer, look development artist, and technical support liaison for productions at the studio and he is one of the primary architects of Imageworks' rendering strategy behind *2012* and *Alice In Wonderland*. Adam started his career in commercial post houses and animation boutiques in New York City as a freelance computer graphics artist. He began his work in film visual effects on the project *Cremaster 3* by artist-filmmaker Matthew Barney. Since then he has served as both effects and lighting technical director, CG supervisor and pipeline developer for various studios in the San Francisco Bay Area. At ESC Entertainment, Adam led the effects team in the creation of complex insect crowd simulation tools for *Constantine* and destruction effects for *Matrix:Revolutions*. As computer graphics supervisor for The Orphanage on *Superman Returns*, Adam oversaw the creation of a ballistics simulation and rendering system. At Lucas Animation Adam was both a rendering pipeline developer and CG concept artist for television and feature animation. Adam's primary interest is in simulation and the construction of complex, but highly usable, systems for dynamic effects and rendering. Adam has a BA from Rutgers University.

**Ben Snow** studied computing and film at the University of Canberra. He started in Computer Graphics while traveling in the U.K., then returned to Australia to set up the computer animation department for a company in Sydney. In 1994, Snow left Australia to join Industrial Light & Magic. At ILM he played a leading role in the R&D

development for *Twister*, *Deep Impact*, *The Mummy* and *Pearl Harbor*. In 2002 he became visual effects supervisor on *Star Wars: Episode II - Attack of the Clones* for which he was honored with an Academy Award nomination for best achievement in visual effects. Snow also received Academy Award nominations for his work on *Pearl Harbor* and *Iron Man*. Snow went to Weta digital in October 2004 to work as a visual effects supervisor on *Peter Jackson's King Kong*. Returning to ILM in 2006, Snow visual effects supervised *Iron Man*, *Terminator Salvation*, and *Iron Man 2*. He's currently supervising ILM's work on *Pirates of the Caribbean: On Stranger Tides*.