

# Cinematographers (not Technicians) Should Light Virtual Productions

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Virtual cinematography today is incomplete: only the camera settings and movement are captured and the on set lighting is not captured at all (or if it is, it is not of “final” quality). To do virtual lighting today, a large number of “Lighting TDs” work out the details with the director in post-production. Instead, a cinematographer’s final quality *physically-correct virtual lighting* should be captured live, on set during virtual production.

The goal of virtual cinematography should be to allow a traditional cinematographer to work in a virtual environment. That implies *virtual* equivalents to the tools they are already using today, whether that be cameras, lenses, lights, gels, flags, silks, bounce cards, or anything else. These tools should not be fundamentally different if we expect to leverage a cinematographer’s experience and accomplish virtual lighting with the same (or greater) time efficiency as a live-action shoot. If the virtual tools can be made faster and easier to use in a virtual environment (and they can), so much the better.

Sophisticated motion capture technology is already used to capture an actor’s performance during production (rather than *creating* a performance in 3D animation software, as, for example, Pixar does with the characters in their films). Similarly, sophisticated technology now exists to allow a cinematographer to “light” a virtual scene using physically-correct lights and surfaces, in real-time, during virtual production – all with final quality.

When a cinematographer lights virtually, the virtual lighting *must* behave the same way as physical lighting in the real world. Fortunately, *physically-correct rendering* software is now available including Mental Ray’s *iray* and Next Limit’s *Maxwell Render*. These physically-correct renderers have recently become able to run in real-time on GPU Compute clusters (or in Maxwell Render’s case, a fast PC), allowing them to provide the immediate feedback cinematographers need to do their jobs on set.

Even better, physically-correct renderers are able to render depth-of-field properly, as well as advanced lens and lighting effects – something the traditional “photo-realistic” renders used in virtual production’s today have a very difficult time doing in real-time, or cannot do at all.

## Case Study: Avatar

The most comprehensive virtual production to date is James Cameron’s *Avatar*. Although a cinematographer

was hired to handle lighting during the live-action scenes in *Avatar*, no DP was used to light the remainder of the film, which took place in a fully CG environment.

(Technically speaking, *Avatar* could have hired a cinematographer to operate the virtual camera, but in this particular case, the director was comfortable operating the virtual camera himself.)

As far as virtual lighting goes, *Avatar* used the traditional Pixar approach of doing hand-painted lighting studies with the art department. Later, a very large team of Lighting TDs at Weta Digital used Pixar’s RenderMan software to create a similar look virtually.

Achieving a given lighting setup for a single shot on *Avatar* involved an enormous back-and-forth effort between Weta Digital and the director. This time-consuming process is a new cost center relative to live-action production. It’s also too labor-intensive to scale up to the whole industry: there just aren’t enough Lighting TDs in the world to create virtual lighting this way.

## The Future

In virtual productions of the future, instead of waiting until post-production to make lighting decisions with a team of technicians, final lighting will be worked out on set by a cinematographer. Post-production will then be responsible for *matching* the exact lighting created by the cinematographer for a given shot, rather than *creating* lighting setups as they do today.

In the future, traditional cinematographers are fully capable members of the virtual production team. Virtual production itself moves much faster, since it is now far simpler to get final lighting on any given shot. Directors work with a cinematographer directly on the (virtual) set, like they do today.

The same logic and production efficiencies that prompted the development of performance capture for *actors* apply equally well to the development of performance capture for *DPs*. Cinematographers, not technicians, should light virtual productions.

## About the Author

Erich Ocean is a filmmaker with a penchant for computer science. He’s exploring making live-action films with virtual production tools and an end-to-end, iterative approach to filmmaking.