

# NowIn3D

magazine | Vol.01 Issue.02

A Continued  
Interview with "Mr. 3D"  
**DAN SYMMES**

**trueVISION**  
Revolutionizing Microsurgery

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# REALD

# 3D HD Live Motion Video Camera is Revolutionizing Microsurgery

The Operating Room will never be the same

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**W**hile sitting in a theater watching a 3D animated movie, it's hard to resist touching the falling rain in front of your nose or ducking below an object seemingly heading your way. And, how about the "Wow!" factor of live motion 3D with a rock star so close you can feel the band on top of you?

But for a doctor performing complex procedures on a delicate eye or navigating parts of the brain, 3D goes beyond the novelty and offers a true picture of the precise movements a surgeon makes while performing procedures, such as removing an eye cataract or resecting a brain tumor.

Just within the past year an exciting 3D HD technology that improves visualization during microsurgery has become available. This digital vision system is revolutionizing how surgeons view the microscopic surgical field and perform surgery. Today, surgeons and audiences can view microsurgery as never before, whether in the operating room or in a remote 3D theater.

The benefits of such a visualization system are obvious: the surgeon is no longer tethered to microscope eyepieces during a procedure. This freedom allows for physical flexibility, healthy

ergonomics, and greater communication within the team. It enables all viewers in the OR to observe in 3D, and the signal can be transmitted remotely to provide viewers in other locations the live 3D video image. Additionally the quality of the image has an improved depth of field over the microscopic optical field.

This same technology has the potential for a host of new digital software applications ranging from fast-track education of fellow surgeons to telemedicine opportunities, to software applications which can drive new surgical techniques.

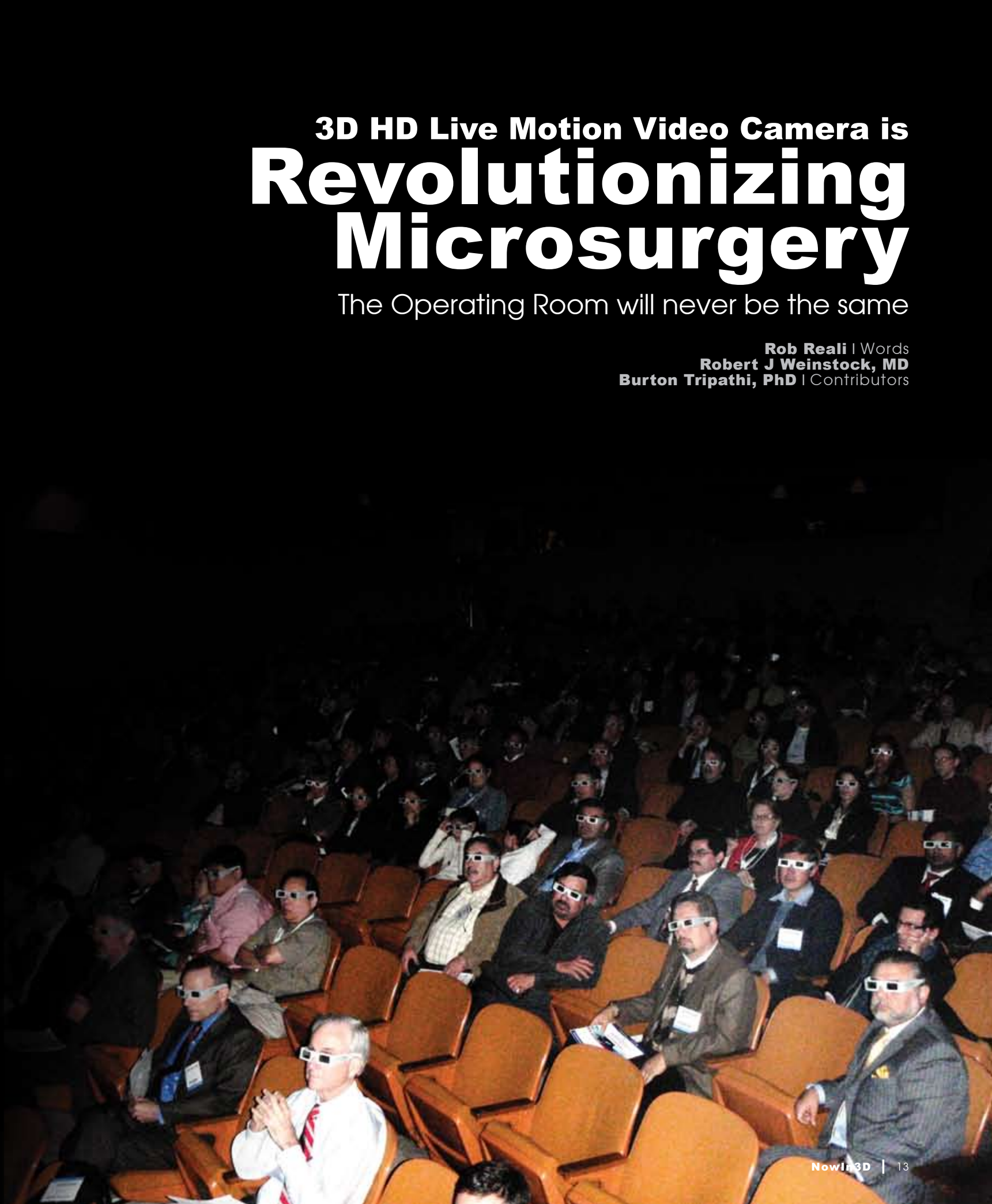
TrueVision Systems Inc. of Santa Barbara, California provides a three-dimensional, high-definition live motion video system for displaying microscopic procedures on a large screen, without giving up the sense of depth and relative space required for microsurgery. Some surgeons are calling TrueVision IMAX for the operating room. The quality of the 3D is at the point where surgeons, including neurosurgeons, can perform procedures lasting up to 12 hours using only the 3D screen. In addition, surgeons do not report feeling any of the potential side effects, like queasiness, that some moviegoers have complained of.

Traditionally, surgeons look through eyepieces of a microscope during surgery,

sometimes using television screens to offer a blown-up, two-dimensional view of the operative site. TrueVision's 3D HD camera takes the place of the microscope's eyepieces and feeds the digital data to a 3D 1080p display system in real time.

The TrueVision camera technology is superior to what's available for 3D, live motion video capture because the stereoscopic camera is a single piece of hardware. Stereo capture is coordinated from dual integrated sensors. In total, the camera processes nearly two gigabits per second providing live video at 60 frames per second for each eye and recorded video at 30 frames per second. The proprietary electronics design stitch together two high-definition stereo views into a single frame 60 times a second.

By comparison, cinematic 3D movie capture today is more challenging. 3D live motion capture is obtained by attaching two cameras together at an optimal convergence angle; then they need to be aligned, oriented, focused and zoomed in perfect synchronization. With the TrueVision technology there's no need to align, focus or synchronize. Certainly over time 3D cameras will come available but for now the TrueVision is the first 3D HD camera available today.



The system offers an education for those in the operating room.

The TrueVision system consists of three components. The first is the 3D HD video camera, called the Image Capture Module. It is a 3D video camera that attaches to most standard surgical microscopes. It can replace the oculars entirely or work in tandem with the primary oculars.

The Image Capture Module digitizes stereo images captured through a microscope and relays them to the image processing unit, a high-end computer, in real time. The computer enhances and processes the images. This is followed by the computer sending the images, one from each ocular view, to a dual projection system.

Second, the dual projection system projects the images onto a specialized rear-projection screen. The screen can be positioned in the operating room so the surgeon is able to see and operate directly from it. The surgeon and any other viewers in the operating room must wear 3D polarizing glasses to allow brain fusion in full view of a 3D image in high definition. As with any projection system, lights can either be left on or off; however, resolution and contrast are greatly improved in a slightly darker operating room.

Most surgeons who have used the system have found that the depth of field and magnification are superior to the ocular view of the microscope. Also, surgeons have noted that the resolution of the first generation camera used today is between 80 to 90 percent of the resolution typically seen through the oculars, which in some cases leads to looking through oculars, rather than the screen, for specific maneuvers where highest resolution is needed. For routine cases in ophthalmology, for example, cataract surgery, corneal surface procedures, corneal transplants, ICL placement and LASIK, many users of TrueVision have found it to be preferable to the traditional ocular view. The second generation Image Capture Module doubles the resolution and will be released this summer.

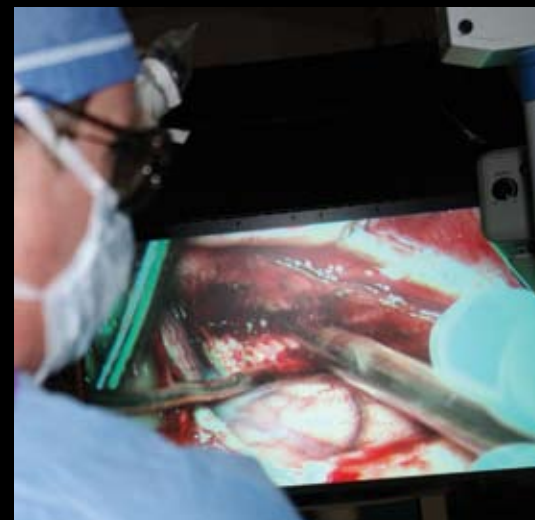
A remarkable feature that changes the dynamics of the operating room is the ability for

the surgeon to sit up or lean back in a chair and get comfortable rather than hunching over the eyepieces with tight shoulders, which is the norm when operating through the oculars. This is especially useful for longer procedures, such as corneal transplants by ophthalmologists or resecting tumors by neurosurgeons where the surgeon may have to look through the oculars for an extended amount of time.

Retina surgeons are beginning to use the system to do vitrectomies, membrane peels and other longer intraocular cases. It is estimated that somewhere between 30 to 40 percent of all eye surgeons suffer from chronic back and neck pain due to continued use of the oculars of the microscope. Performing surgeries “heads up” with TrueVision may turn out to improve the quality of life for surgeons and the longevity of their career.

The system offers an education for those in the operating room. As a communication medium TrueVision enables the operating room staff, nurses, residents, fellows, and even members of patient’s families to view surgery on the 3D screen and have the exact same experience and visualization the surgeon has. The operating room technicians and other personnel enjoy the device because they are now able to fully appreciate what is happening during a case and better anticipate the surgeon’s needs for additional instrumentation. The scrub technician is able to follow the case much more closely as he/she can also watch the screen and hand instruments in a much more efficient manner.

In addition to operating room education, the unit is able to send its 3D high definition signal to a remote location, such as an auditorium within the building. This may work extremely well for teaching institutions where a group of surgeons or students can be assembled in an auditorium while a surgeon is operating in a suite nearby. The 3D high definition images can be projected in the auditorium in real time allowing for comments, questions and feedback between the surgeon and his viewers.



Photos courtesy of TrueVision.

For surgeons that do any teaching or educating, TrueVision has a video recording and playback feature. 3D HD video will be useful and productive for surgeons in training and students to view cases in such detail not possible until now without actually being in the operating room and looking through oculars. This may lead to a shorter learning curve on surgical procedures and more collaboration between surgeons on procedures and techniques.

It is likely that many surgeons who play a role in surgical education and participate in training courses will begin to record their cases with this 3D system to present surgical techniques and educate other surgeons in a 3D format. This ability will improve the educational value of these meetings and courses. Sharing recorded procedures in 3D will facilitate collaboration during training courses for new surgical techniques, for grand rounds symposia, and for general course and educational purposes.

At the American Society of Cataract & Refractive Surgery conference held in Chicago last April, TrueVision 3D HD premiered the first courses where 3D was a standard of education rather than one of curiosity. Over a dozen surgeons presented their educational cases.

A very interesting application of TrueVision is its ability to generate marketing opportunities. Surgeons who use this technology and have space in their office to hold cataract or LASIK seminars can broadcast a 3D view of their surgical procedure to a waiting room or other remote location where potential patients can view the entire procedure. This can dramatically add to the value of a cataract or LASIK seminar and give potential patients a unique opportunity to view intraocular surgery the way a surgeon sees it. A significant marketing component to this new technology is helping surgeons put patients at ease and making them more comfortable with the concept of intraocular surgery. 3D should not be underestimated for its ability as a communication medium.

It is easy to imagine future possible telemedicine applications where surgeons are able to share live or recorded 3D images with colleagues for remote consultations. The United States Army is looking at providing telemedicine services using TrueVision. Until now this has not been available in the ophthalmic disciplines.

Real-time digital visualization opens the doors to develop software to assist during surgery. The future holds the potential for sophisticated suites of applications for microsurgery.

TrueVision is developing applications to further enhance the projected image on the screen and will create software to help during surgery. Application examples include the ability of the surgeon, or assistant, to use a 3D cursor to draw on the screen to guide surgical maneuvers such as limbal relaxing incision, wound placement and architecture, capsulorhexis size and formation. Digital applications will make it possible to color code the depth in the eye giving visual clues as to the depth of instrumentation inside the eye. In other surgeries the integration of MR and CT data will allow neurosurgeons and others to enhance images for guided surgical approaches.

These are just some of the current and potential applications of TrueVision. As the device improves, the ability of transmitting data improves, and with the addition of software, there is only likely to be more opportunities for TrueVision to make its way into fields of medicine. In fact, there is a likelihood that any industry based on stereomicroscopes, like manufacturing, may eventually be replaced with a 3D viewing system, such as TrueVision.

This exciting 3D HD technology is here to stay. It is revolutionizing how surgeons perform microsurgery and efficiently teach and train new surgeons. Advances in 3D can perhaps change medicine forever as a standard of care plus over time proving that 3D visualization for microsurgery will lead to better surgical outcomes. [www.truevisionsys.com](http://www.truevisionsys.com) |