A thousand words (and more)

Artists and IT specialists are breathing life into biomedical science.

BY RANDALL C. WILLIS

Despite the technological advances that scientists and engineers have made over past decades that have allowed drug discovery to become a thriving industry, one of the biggest bottlenecks in drug development remains communication. Not between machines or software packages, but between humans.

To the head of R&D, the bench researcher or group leader must be able to explain the potential impact of a new discovery. To regulatory agencies, scientists must explain the mechanism, efficacy, and safety of their new chemical entity. To the sales staff, a marketing manager must explain how the drug functions and whom they should be targeting. To physicians and patients, sales and advertising staffs must explain the benefits of their new product.

If modern research has taught us nothing else about the workings of life, we have quickly come to appreciate that complexity exists on multiple levels—molecular, organism, and population. Explaining this complexity in words can be something of a nightmare, but where every picture is worth a thousand words, a two- or three-minute movie might just say it all.

Science meets CGI

Developments in computer hardware and software, as well as a concerted effort by various universities and colleges to forge links between science and art, have led to a new generation of information technologists and designers who hope to do for biotechnology and drug discovery what George Lucas and Steven Spielberg did for Hollywood. By combining thorough scientific analysis with high-end computer graphics and animation capabilities, these artists hope to take medicine to the next level of reality (Figure 1).

"We see medical animation as an integral partner for any medical technology," says Jeff Hazelton, president of BioLucid Productions (*www.BioLucid.com*). "In 2–3 minutes, a medical animation can deliver a clear message that details the medical technology, how it works, and what sets it apart from other technologies, and it can be done in an entertaining fashion."

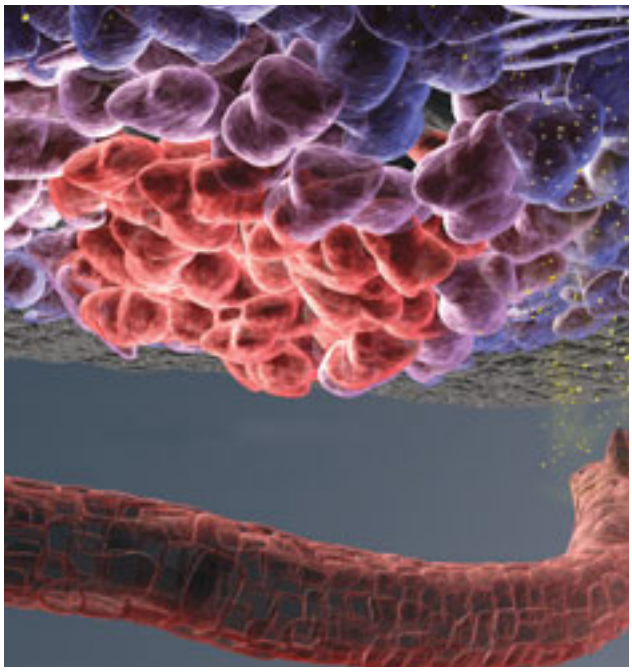

Figure 1. It came from above. Using computer technology more often associated with films by George Lucas, animators can create short movies highlighting the biomedical principles behind angiogenesis. (Courtesy of BioLucid Productions.)

"With all of the time and effort that go into developing today's latest biotech innovations, it would be folly not to communicate that in the clearest terms with 3D animation," he adds. "People generally don't invest in technologies they don't understand, and a medical animation that is done correctly allows the audience to understand."

Founded in 2001, BioLucid has seen its revenue stream double annually as its reputation spreads and it contracts with big players, such as Amgen and Pfizer, as well as smaller firms, such as Salix Pharmaceuticals and Prometheus Labs. Hazelton's goal is to provide his clients with a distinct competitive advantage in the marketplace, and he strives to make a meaningful contribution to medical science by enabling a better understanding of rapidly advancing technologies.

"We recently developed a drug delivery animation for Salix's Colazal that depicts the unique bacterial azoreduction that their compound goes through to make it more effective in treating ulcerative colitis," Hazelton adds.

Of course, BioLucid is not alone in this market, and many companies that once simply supplied biomedical illustrations for brochures are branching into animation. In 1996, neurologist Brian Somerville founded Animated Biomedical Productions (ABP), which was based on his efforts since the mid-1980s to use animation to teach medical students.

"Animation takes the learning phase a step further by showing events such as meiosis and protein translation as the dynamic processes they are," Somerville explains. "Individuals involved in biotechnological research can use animation to explain a wide range of complex topics, including the rationale of cancer therapies based on cell signaling, the use of DNA microarrays, and genetic engineering."

Although many of his clients are advertising agencies or the media—in 2003 ABP animations were featured in the Discovery Health Channel program *Supersurgery*—Somerville and ABP have also done extensive work for biopharmaceutical firms, including PowerPoint animations of an anti-obesity drug for Metabolic Pharmaceuticals, Ltd., a video featuring white cell stimulation

by the drug Neupogen for Amgen, and a genetic engineering DVD for BresaGen, Ltd.

The animation process

Creating a successful animation is an iterative process, involving multiple rounds of discussions between clients and artists (Figure 2).

"We have an established and proven workflow that we use to create all of our animations," Hazelton explains. "The process begins with a meeting between one of our writers, the animation director, and the client team, which usually consists of a scientist, marketing person or sponsor, and perhaps regulatory personnel. We discuss the objectives of the animation and collect all of the information that is then used to create an outline and rough sketches. These are then presented to the client for discussion and approval."

Once the client is satisfied, the project moves to the storyboard stage. Like images from a comic book, a storyboard gives the client an idea of the action to be shown in each scene. The designers then create style frames, samples of images on which the client can specify details or request modifications. The next stage is modeling, where accurate 3D models are created or modified to fit the purpose.

"This is often the most time-consuming step in the entire animation process, but the accuracy of the animations depends heavily on time spent in the modeling stage," Somerville explains.

In the texturing and lighting stage, designers give substance to the 3D wire frames—so-called because the models resemble birdcages composed of a mesh that can be deformed to fit the desired shape—by placing a virtual surface over the mesh that is textured, colored, and lit appropriately. The designers then use the computer to render these frames into an animated sequence, which is edited together in layers with other such sequences.

"When enough clips have been created, we put a rough cut of the movie together with voice-over so that the client can run it through their review process," Hazelton adds. "After approval of the rough cut, special effects, music, and narration are added to make a polished production."

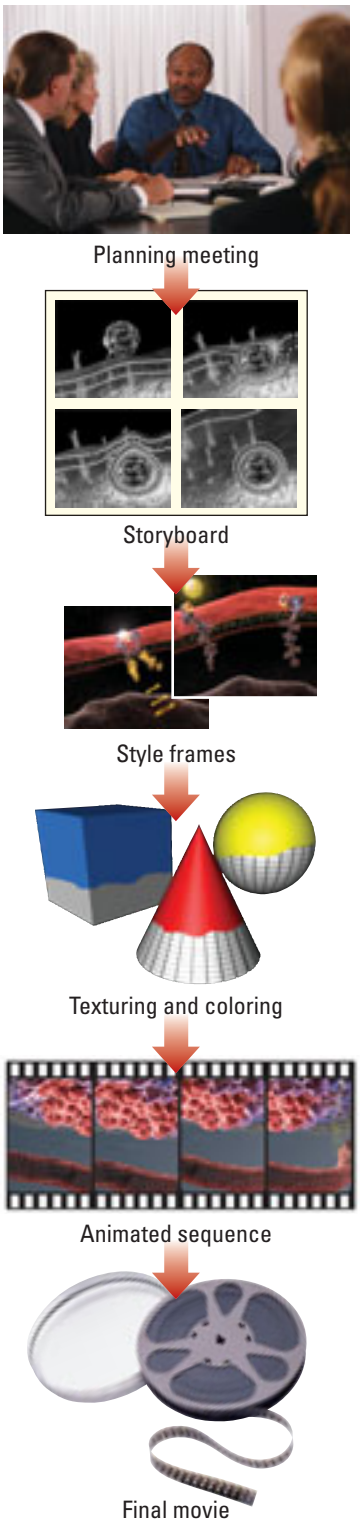

Figure 2. Making movies. The animation process requires the interaction of scientists, artists, and managers. (Technical images courtesy of BioLucid Productions.)

Home(made) movies

However, not everyone can afford or wants to spend the $30,000–80,000 that some of these projects can cost, and would rather focus on developing more modest animations in-house. For example, BioVeris Corp. (formerly IGEN International), a subsidiary of Roche Holdings, has decided to generate its own animations.

"We use animated media for training, business development meetings, and presentations to customers," says Alan Jernigan, director of business development and marketing at BioVeris. "However, we also use them for scientific application presentations both internally and externally."

The BioVeris movies, largely developed by its IT and marketing departments, look less like the high-tech thrillers developed by ABP or BioLucid and more like the animated films you saw in high school—simple 2D illustrations of resin beads and antibodies strung together with a straightforward narrative. For all their simplicity, however, the animations still quite effectively explain the complex chemistries with which BioVeris and its clients detect everything from proteins in medical samples to bioterrorism agents.

One of the challenges of producing these homegrown ventures, however, is the lack of easy-to-use software tools.

"It would be nice from my perspective if there were a software package that made it as easy to create these animations as PowerPoint," Jernigan says. "Even Macromedia Flash, with all its simplified features, is still too complicated for those who are not programmers or don't know the language."

"I would like to see a plug-and-play software that allowed you to click on preset backgrounds, objects, photos, or diagrams," he continues. "They would be generic to the pharma and biotech industries, but would allow you to create various animations to drive home your message to both internal and external customers. The program should be as vivid and dynamic as Flash but without the hassle and complication of learning a new language."

Whether anyone answers Jernigan's challenge, however, remains to be seen.

Biomedical Babel

Language problems aren't limited to people who develop in-house animation projects. As more of these projects are added

to corporate webpages, animators have to be aware of the variety of viewing packages that are available to the end user—such as RealPlayer, QuickTime, and Windows Media Player—and the formatting restraints that this causes. In some cases, rather than exclude a subset of viewers from their movies, designers are forced to offer animations in multiple formats.

"Almost everyone has Windows Media Player at this point, so that is a format we always account for," Hazelton says. "Quicktime is also very popular. I think much of it comes down to the personal preference of the user, but as developers, we have to account for as many of the players out there as is reasonable."

"This issue is not only with animation but also with all video, so you can imagine the effort that has been put toward its implementation on the Web," he continues. "There are many formats because there are no imposed standards. But as is always the case, Microsoft seems to win out with a large share of the media players out there. As long as it makes a good-quality product, that is fine with us."

A growth industry

As software packages continue to develop and the pressures increase on companies to expand market share, the use of biomedical and technical animation will grow. According to Jernigan, BioVeris will continue to use this medium as the company develops its message and products. Likewise, he has found that most companies in the biotechnology and pharmaceutical industries are using some sort of animation media.

Hazelton agrees. "Drug discovery companies use a great variety of technologies, and they often wish to differentiate their own processes from the competition," he explains. "With 3D animation, it is possible to express these ideas in the clearest and most effective manner. Molecules come to life, broad concepts can be explained and linked together, music and narration enhance the viewer's experience and help to tell the story. When we take this well-refined art of telling a story and combine it with all the innovation occurring in biotechnology, it gives us the ultimate tool for depicting and promoting scientific concepts, even the most complex." ■