Figure 23.1 *Filmmaker Al Razutis is a complete 3D artist who makes holograms, 3D videos, and stereoscopic wall art and installations. Stereophoto by Ray Zone.*

Chapter 23

Al Razutis: A Complete 3D Artist

Meditations (1996), *Dean Fogal: Corporeal Art* (1996–1997), *Virtual Flesh* (1996), *France 97* (1997–1998), *Statues* (1997–1998), *Nagual* (1998)

Al Razutis grew up in Los Angeles in a movie and TV culture that featured rare moments of 3D in an otherwise 2D or "flat" film world. But the Hollywood culture and media relevance vanished for Razutis in the 1960s as he plunged totally into the underground and experimental art and cultures of the antiestablishment 1960s. That liberated Razutis from what he has called "the overbearing and commercialized slop that had become the norm." And that, of course, motivated Razutis to produce all kinds of experiments with film, video, and multimedia arts in 2D and 3D, which he continues to produce to this day.

"When I think about 3D movies in LA when I was a kid, they never got me going as far as wanting to make my own, because the subjects, typically horror, and formats, typically big-screen or studio releases, were both 'entertainment' and inaccessible as to how I would get into making them," said Razutis. When he first saw an underground film, Andy Warhol's *Chelsea Girls* in the mid 1960s, that got him going. Razutis felt that if Warhol could make such a freeform artistic and noncommercial film (as did other underground filmmakers showing in the 1960s), he could too. "So I showed and made underground movies in the late 1960s and started shooting stills and primitive computer graphics in 3D in the 1970s and continued into 3D video and film ever since."

Razutis's experience shows that what can get an independent filmmaker started, whether in 2D or 3D, are portable low-cost cameras, like the Bolex 16mm 3D in the 1950s, or the 1988 Toshiba 3D camcorder, or the recent 2010 Fuji W1 and W3. Affordable editing with desktop editing and inexpensive postproduction tools today are also important, as well as the possibility of affordable nontheatrical showings on 3D TV or low-cost gallery/theater projections. "With low-cost portability, everyone who is inspired by 3D can start making, distributing, and showing their own works, and on their own terms," said Razutis. "Money doesn't have to determine success. A 3D film culture is possible, as has been the case since the creation of cinema."

Figure 23.2 *Al Razutis is shown here in 1996 wearing alternating-field liquid-crystal shutter (LCS) glasses for use with his Toshiba 3D camcorder and conventional 60Hz TV.*

There were no readily accessible 3D Bolex adapters in the 1960s (they were there, but really under the radar), so Razutis experimented with 3D CG using 16mm cameras and intervalometers on a monochrome screen with 64k memory. “This was simultaneous with my experiments with making ‘3D movies’ featuring individual holograms recorded on a cylindrical film gate with slit apertures and projecting holographic images on silver parabolic screens so that the image (typically static) would ‘float in space,’” said Razutis. “Even if I had to work in ‘static’formats, I always saw it in motion.’”

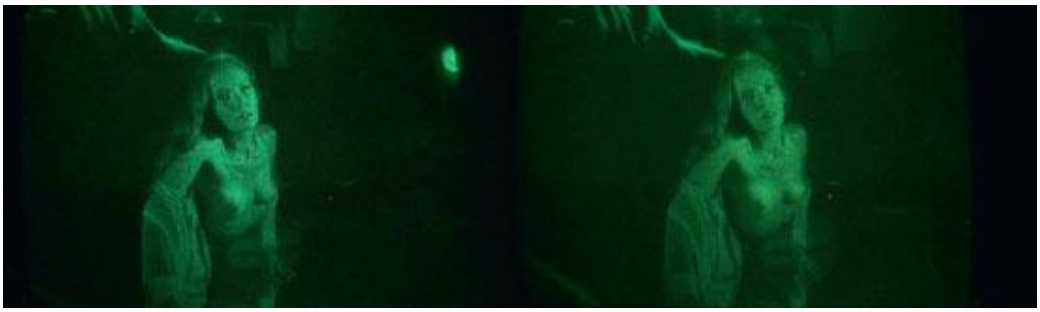

Figure 23.3A

Figure 23.3B *In the early 1970s, Razutis started a lab to make holograms.*

Figure 23.4A

Figure 23.4B *Holographic cameras were self-built at the Visual Alchemy laboratory of Al Razutis*.

In the early 1970s, Razutis started making holograms at a studio lab, Visual Alchemy, which he built up for holography, film, video, audio, and film optical printing. This happened because the holographic cameras were self-built, experimental, affordable, and the audience had seen nothing like it, so it grew. Razutis has subsequently been making 3D movies in one form or another throughout his entire adult life—for over 40 years and counting.

In the late 1970s and through the 1980s, Razutis continued to shoot experimental movies and stills in 3D; was a film professor at Simon Fraser University in Burnaby, Canada; and taught several students the arts and crafts of 3D cinematography and editing. Among his students was the late noted IMAX 3D cinematographer Noel Archambault. At the time, 3D projection was done on a hand-built and painted silver screen with polarized glasses and dual-interlocked 16mm projectors.

In 1995, Razutis discovered the portable Toshiba 3D camcorder when his friend Gary Cullen, a holographer and collector of 3D, showed Razutis his Toshiba 3D camcorder. Razutis immediately borrowed it and made use of it. With this camera and various external recording decks, 3/4-inch U-matic, S-VHS, 8mm, Razutis shot both documentaries of holography and holographic artists of the time for a project titled 'West-Coast Artists in Light', in Vancouver and Los Angeles. He also created a number of '3D video art' shorts, among them *Virtual Flesh*, *Statues* and *Nagual*, which were exhibited at the Louvre in 1997, at premiere Screenings in Vancouver and Portland in 1998, and at the first LA 3D Club Film Festival in 1999.

Figure 23.5A

Figure 23.5B *Razutis created 3D worlds in VRML 2.0 in 1997.*

Razutis's ideas came from the compulsion—inherited from his avant-garde film work—to re-create in 3D various "worlds," whether they were derived from photographic subjects (people, scenes, landscapes) or synthetic subjects (like VRML 2.0 worlds, their textures and movements). "I shot in analog alternating-field NTSC 3D a variety of live-action subjects (mime artists, landscapes, travel locations, meditational scenes, city, and nature) and at the same time was involved in creating 3D 'worlds' in VRML 2.0 and in 1997 at the Banff Media Centre in Alberta, Canada, which supported art projects."

At this point, in the late 1990s, Razutis was working with both "passive" 3D, in which he made 3D videos and projected them in film theaters and galleries on a silver screen using two matched video projectors with Andrew Wood's demultiplexer. "I was also experimenting with 'interactive 3D,' building VRML worlds with stereoscopic (anaglyph) texture maps on world objects and viewing them (occasionally) in stereoscopic 3D on SGI Indy machines and flicker glasses or VR

headwear," added Razutis. "The ideas just kept coming, but the self-financed 3D movies would fluctuate depending on the state of my finances."

Figure 23.6A *Here is Razutis's editing station in 1999 in Baja, Mexico*.

With the introduction of desktop digital video editing in the 1990s and their improvements and popularization in the years following, it was possible for Razutis to lose that analog editing bay. Razutis believes that it really wasn't as good as its predecessor, the film editing bay, whether upright or flatbed. So he began editing and posting analog, then purely digital works for editing and output by computer. Along with nonlinear desktop editing of 3D video clips and subjects, the desktop computer became a tool for authoring CG scenes in stereoscopic 3D and has brought in a new era of filmmakers who create interactive worlds in 3D games. "The fact that stereoscopic 'interactive' first-person shooter games are a form of cinema and 3D film," said Razutis, "should come as no surprise. In the 'old days' of the 1990s, we created virtual worlds where one could change your size (like Alice), fly, walk, touch an object, and play sounds or movies." Razutis pointed out that the viewing of these worlds has been around since the late 1990s, with Nvidia and Asus workstations in stereo 3D.

Figure 23.6B *After converting to digital, Razutis assembled a complex editing station that enabled him to migrate through different computer programs.*

Figure 23.7A

Figure 23.7B *The desktop computer became a tool for authoring CG with avatar humanoid characters.*

Razutis created speech-interactive virtual reality (VR) with avatar humanoid characters in 2D and 3D for the Mission Corporation in Bellevue, Washington, from 2000–2001 where he was employed in a day job as manager of the 3D VR projects. "This is when we demanded fast processing," said Razutis, "and we built our own set-top boxes to display VR. Later we saw those similar standards implemented in the first Xbox releases. And it all started with wire-frame boxes for me in 3D."

The subjects chosen by Razutis for his 3D films were usually based on his art activities at the time. "If I was involved in early computer animation, teaching, experimental and avant-garde film, or documentaries on holography, then these subjects were either incorporated as the subjects for 3D movies or influenced the subjects chosen for 3D movies," he said.

If he was shooting a hologram or holographic studio, Razutis found that he really didn't need to move the camera to show that the holographic image was in fact 3D. As a result, a lot of static compositions were used, and Razutis then directed that the action inside the stereoscopic window and space, provided the defining movements and definitions of that space. Razutis found this extremely interesting when shooting holographic image projections through the "window," and this resulted also in a number of 3D movie collaborations with Dean Fogal of the Tuba Physical Theater in Vancouver. With these works, he used a mime artist to tell a simple story. He would

define the narrative elements of his story in a stereoscopic space using the Toshiba 3D camera and portable recorders. These were extremely low-budget shoots either on location or in a studio, shot like a Lumière movie with few edits.

Figure 23.8A

Figure 23.8B

Other subjects were chosen for their value in depicting transformation in cities and nature or in the human body and human actions. In his 3D video *France 97* (1997), Razutis used superimpositions in 3D or long transitions in 3D to compare forms and movement. Or he would compare movement and stasis in *Statues* (1997), which was also shot in Paris. Razutis would use movement against a flat screen in *Virtual Flesh* (1996), where naked bodies of various ages and sizes, including pregnant women, would morph into each other (via post) and create sculptures of the human body in motion and in 3D as a gallery projection or installation piece.

Razutis has always made 3D movies with whatever tools that were available to him. “When I could get my hands on a camera or capture tool, I went for it,” he said. As an independent 3D filmmaker, Razutis was sometimes employed at the university, and at other times was a freelancing artist, so his circumstances always varied.

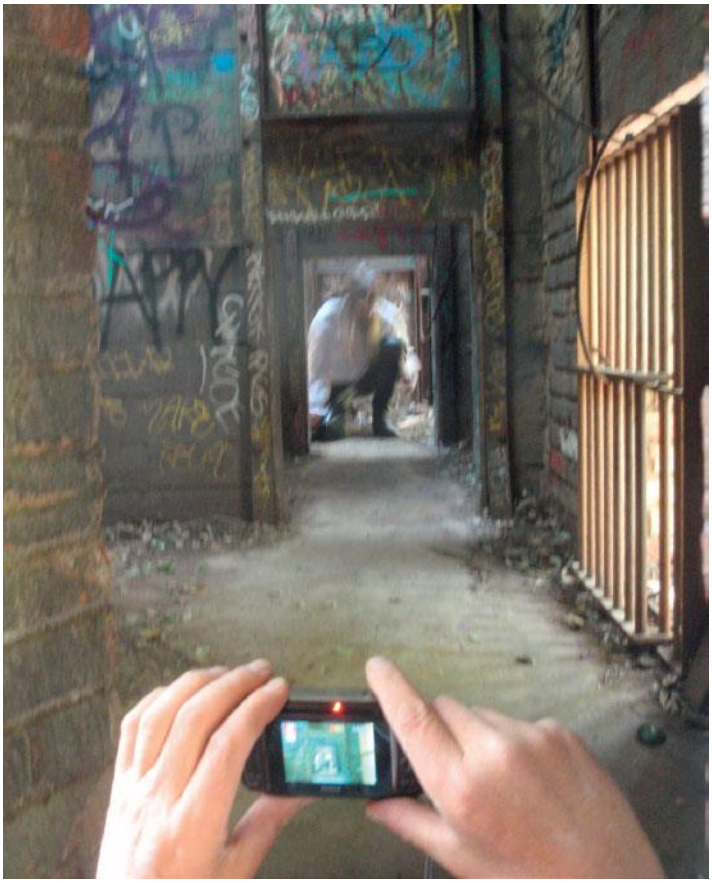

Figure 23.9 .

Camera and capture tools that became available to Razutis ran the gamut from dual-camera rigs to the Toshiba stereo camera, the NuView stereo adapter, or dual-HD cameras for recent shoots in 2010. ”Good tools may make it easier to make 3D films,” said Razutis, “but not necessarily ‘better’ 3D films.” One of Razutis’s favorite sayings is that it is not the “typewriter that creates a good novel.” That means that just because a 3D filmmaker has high-end equipment and a big budget doesn’t guarantee a good 3D movie. “When you can’t get the right tools to serve the vision,” said Razutis, “the compromises can overwhelm you, or you might have to wait for a better opportunity to create. Ultimately, it is the audience, whether in a 3D club, an art gallery, or in a multiplex 3D theater, that will determine that success or failure of the work.”

Figure 23.10 *Razutis has frequently explored the idea of stereoscopic space from a fixed camera position.*

Razutis believes that there is a luxury in using primitive and handmade tools. He characterizes it as the luxury of thinking, evaluating, and imagining that comes with "slow" technology. "I learned this when I would optically print, one frame at a time, my experimental films," he said. "At that time I had the luxury, during those slow times, to imagine the next film I would make, and the next."

Though high-end technology and HD may be important, Razutis believes that "high-resolution 3D and pixel counting are not an 'aesthetic' except when one is solely pursuing high-definition orthostereoscopic photo 'realism' or a spectacular 'magical realism' of CG. Or the filmmaker may be trying to achieve live action that is 'rich' with textures and technical details. It's a matter of aesthetic preference, budget, and film culture that determines whether we go HD, holographic, or work in SD and other formats like the Web," said Razutis.

Razutis believes that this idea may also apply to whether the 3D filmmaker shoots alone, solo, in small groups with friends and collaborators, with a big crew using insured expensive camera rigs and the latest studio environments, or at distant locations requiring more permits. "Some limitations, such as shooting solo, can open up choices," said Razutis, "and the aesthetic work that is required to imagine alternatives and possibilities. Some absence of script brings on

improvisation and no need for hierarchical crews and scheduled continuities to implement. A solo production schedule is always changeable, adaptable to all kinds of things, and is not slave to a contract."

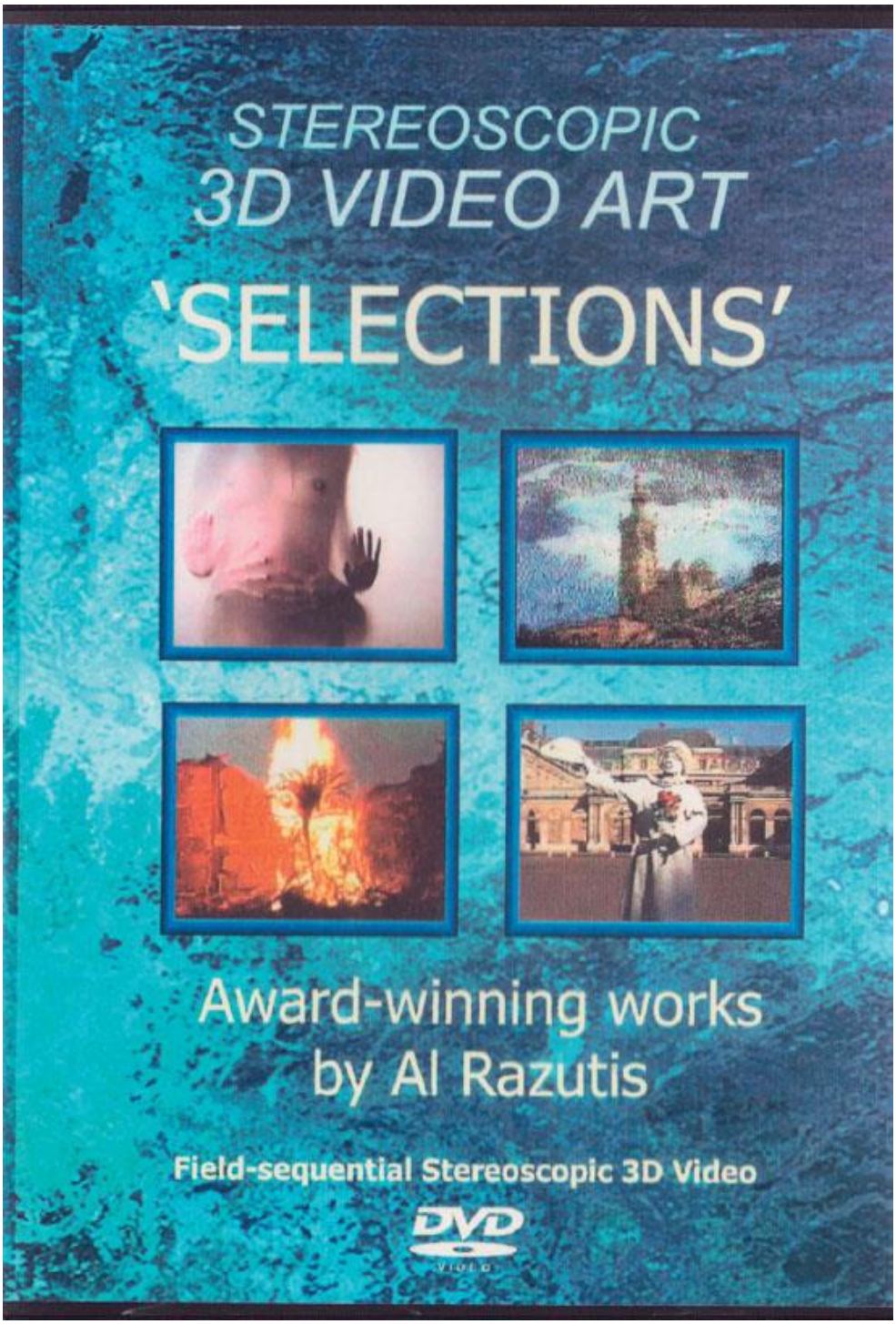

Figure 23.11 *Razutis released some of his award-winning 3D shorts on an alternating-field 3D DVD in 2003.*

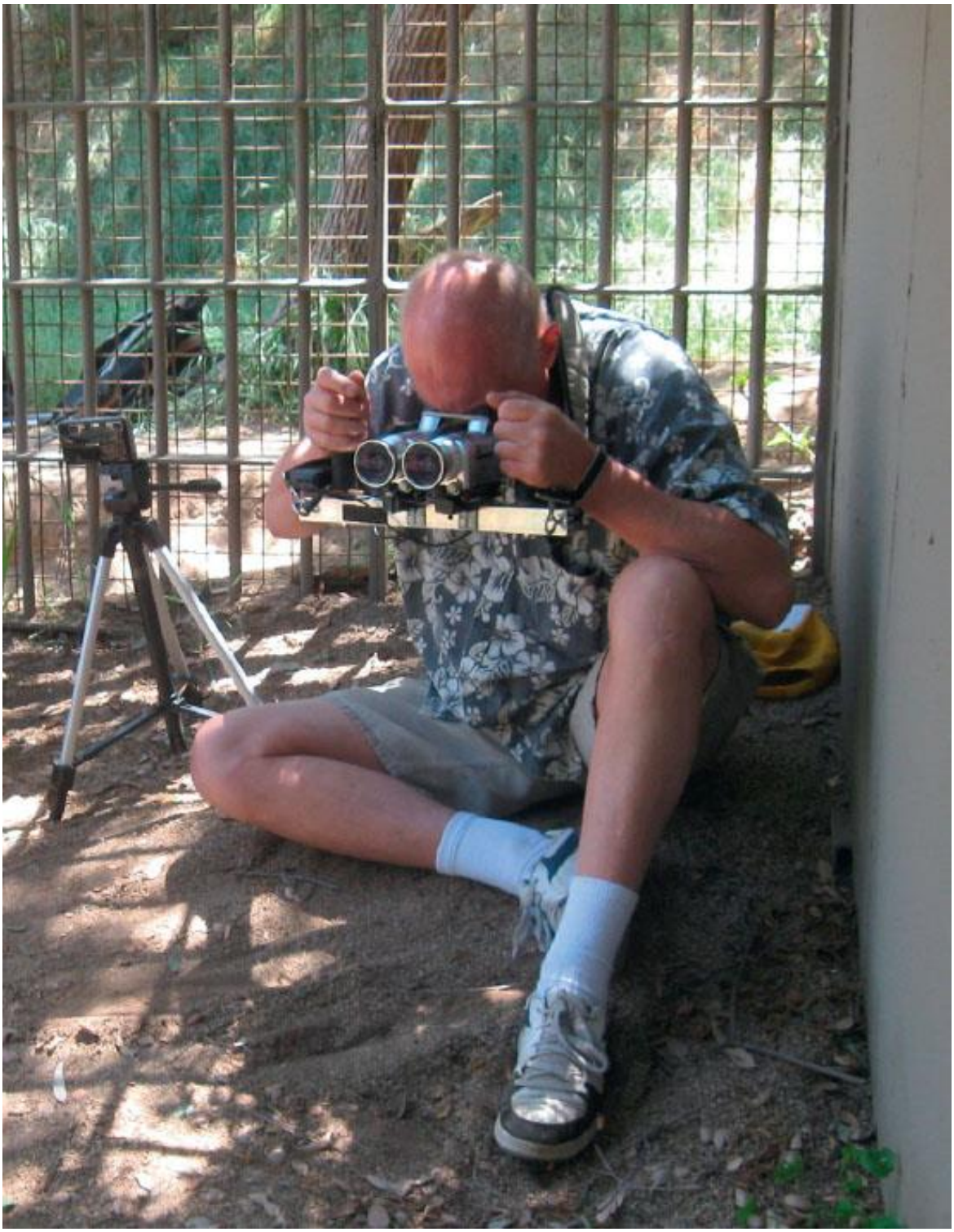

Figure 23.12

Figure 23.13

Figure 23.14 *Artistic preference, Razutis believes, should determine the 3D toolsets, whether the filmmaker works alone or in a group.*

Figure 23.15 *Razutis's friend Chuck Paxton with a compact side-by-side pair of HD video cameras on a bar.*

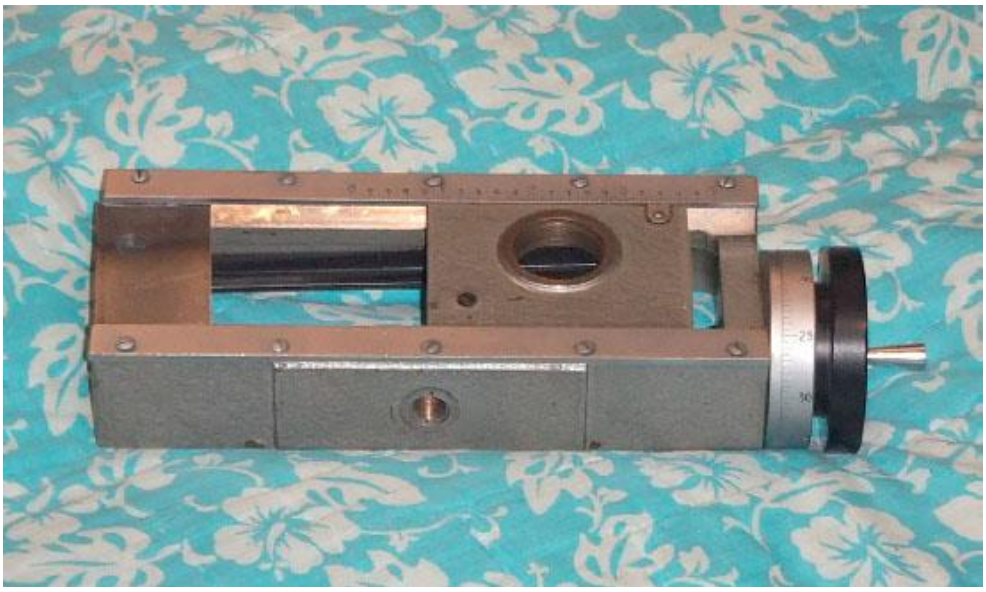

Figure 23.16 *A custom "twin bar" with variable interaxial built by Razutis for shooting 3D with a variety of digital cameras side by side.*

Figure 23.17 *Two CCD sensors in parallel position on one of Razutis's slide bars for 3D capture*.

So far Razutis has only used side-by-side, or dual-lens, camera rigs. "I avoid beam splitter rigs due to their optical fragility and large size, which limits mobility and increases setup time," said Razutis. "Why use a large beam splitter rig, requiring assistants and constant cleaning, calibration, when one can benefit by simpler 3D rigs? Only in close-ups and special applications, and bigger budgets, does a beam splitter rig make sense to me."

With an art and avant-garde film background, many of Razutis's materials, subjects, and techniques hark back to his own earlier works or the avant-garde works of others and involve experimentation with all aspects of production and editing in postproduction. "Early on, I was interested in the virtual body and performance art, so I teamed up with a mime artist, Dean Fogal, a student of Marcel Marceau, and did a series of mime works in 3D that mapped out the space and narrative of the performance in 3D," said Razutis. "This interest in virtual bodies manifested itself in my 3D video *Virtual Flesh* when I took 12 nude people of various ages and sexes and created a moving sculpture in 3D video. I was dissolving and superimposing one figure upon the other as they thrust themselves out of the screen in 3D projected on large screens. In this way, they created mutations of human figures and bi-figures in a space that was impossible in sculpture and only sometimes achievable in holography." Razutis's fascination with the virtual body has resulted in some holographic works, *Surrogate* (1974) and*Surrogate Dressed for Art New Vogue* (1984). This fascination has also had an effect on his work in 3D virtual reality and avatars in gaming since 1997.

Razutis went through a fixed-camera or "primitive" phase after Lumière films, and this was followed by an imaginarium phase after viewing the films of Georges Méliès. "After my 1997 Louvre show, which was soundlycriticized by a few avant-garde filmmakers, but generally liked

by most, I began shooting strange angles, moving, strobing, layering images, and playing with time echoes and image ghosting," he said.

For a while, Razutis was quite fascinated with time delay, visual echoes of delayed movement, and movement versus stereo 3D concreteness. This fascination was most evident in his short 3D film *Statues*, in which everything that moves in the scene features time-delay echoes, and everything that is still in the scene, such as the mime artist, has a 3D concreteness that is set off from the time-delay-induced "flatness" of moving subjects. This, in essence, was an example of Razutis violating the rules of 3D moviemaking at the time, and he loved it.

"I also melted moving scenes into 'melting' color scenes (utilizing switcher time-delay effects and simple col-orization/quantizing) in *France 97* when shooting through a high-speed train window," said Razutis. During that precise shoot, Razutis thought about what the avant-gardists in France had said to him about being too conservative. "I imagined, as I shot from the moving train, that the landscapes would be subject to Impressionist technique because, very simply, I was passing through the countryside where the Impressionists had painted, at the very same time," he said. "I think most audiences didn't get that at the time (1998) when it was shown in LA, Vancouver, and Portland. At that time, 3D movies were either old Hitchcock and Hollywood horror, and this '3D video art,' as I called it was as bizarre to them at the time as was my 'Visual Alchemy' traveling holography exhibition in 1977." But because it was not client-driven or -financed work, Razutis enjoyed every moment and went on from there.

Razutis was also was fascinated with the installation qualities of 3D whereby a 3D image would be projected on a flat (silver) screen and its image would essentially occupy a volume within the aperture of that screen, with some parts projecting in front and some parts behind. "This site-specific installation art interest also informed my short 3D movie *Virtual Flesh*, with its superimpositions and dissolves of a dozen male and female bodies, merging and mutating in space, and was largely an extension into the audience of the screen itself. This work, though released for home 3D TV viewing, and projected on a very large screen at the Louvre (1997), was intended to be a live gallery installation in which a viewer wearing 3D headgear could interact with the projection in a real-time mix using touch sensors and a video mix of viewer and projected subjects.

Figure 23.18A *This is a cross-view or short-focus stereo pair. To view in 3D, simply hold a finger over the middle and focus on it. The third image that forms in the middle will be the 3D image. Keep practicing or look at the anaglyph version.*

Figure 23.18B *Hats floating on water as if they're in clouds*.

Razutis's work in 2010 with 3D HD has been largely a matter of discovering new subjects and techniques suitable for digital 3D HD presentations, whether at home on 3DTVs or in a theater. His current interests in many subjects and artistic traditions continue. "I'm shooting holograms on 1080p HD 3D," said Razutis, "and I'm shooting hats floating on water as if they're in the clouds. That kind of stuff plus dramatic and interactive media compels my interests. And it all has to be in 3D from now on."

What Razutis really likes and marvels at in 3D are images floating in space, as is typical in holography. He believes that it is a collective dream that everyone shares and that all people are intrigued by it. "Weightless, floating, disembodied, phantasms have fascinated us all for centuries," he said. "If you ask people today what they think a hologram is, they will say 'an image in space' and confuse the idea with its simulations in *Star Wars*or other sci-fi flicks." Razutis believe that this is an image-idea that may conform with dream states and that it may exhibit characteristics of freedom from physical confines such as a screen, a window or aperture, or semivisible volume screens with 3D images projected on a mist or grid, as in theater. "That image in space phenomenon, and the fact that it could be turned inside-out," said Razutis, "is what got me going in holography. It was the image projecting from the screen or bisected by the screen that got me started in stereoscopic 3D."

When the stereo window vanishes, through composition, lighting, ambient contrast, and color, the stereo 3D image is in "space," and that is what fascinates Al Razutis.. "I'm not a photorealist or that interested in realistic orthostereoscopic recording and display," he said. "To repeat, or try to repeat in stereoscopic 3D film what my eyes see in a natural scene seems to me quite boring and pointless. It could possibly serve a narrative function in a film I am making, or may have a place in a commentary that is stereoscopic film art."

Figure 23.19

Figure 23.20 *Razutis gets the proper camera angle to shoot floating material in 3D.*

Sometimes Razutis's choices come from dreams, sudden inspirations, or an image discovered on the Web. "Sometimes images come from plain irrationality, or surrealist jokes and automatic writing—tricks that my mind will play on me." Through the years, Razutis has investigated dreamtime and derived works from that, where his interests in alchemy and psychoactive creation methods gave him ideas for further works.

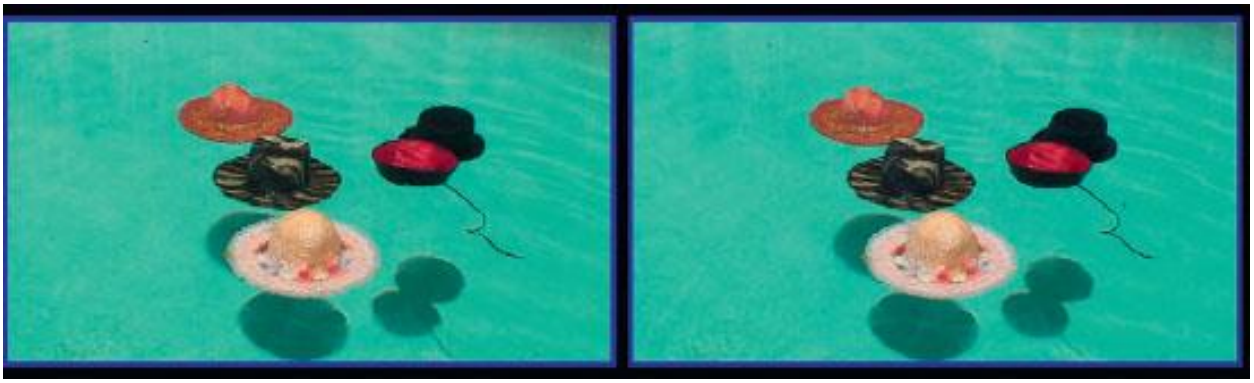

Figure 23.21 *This is also a cross-view stereo pair of images. The hats should float out over the water.*

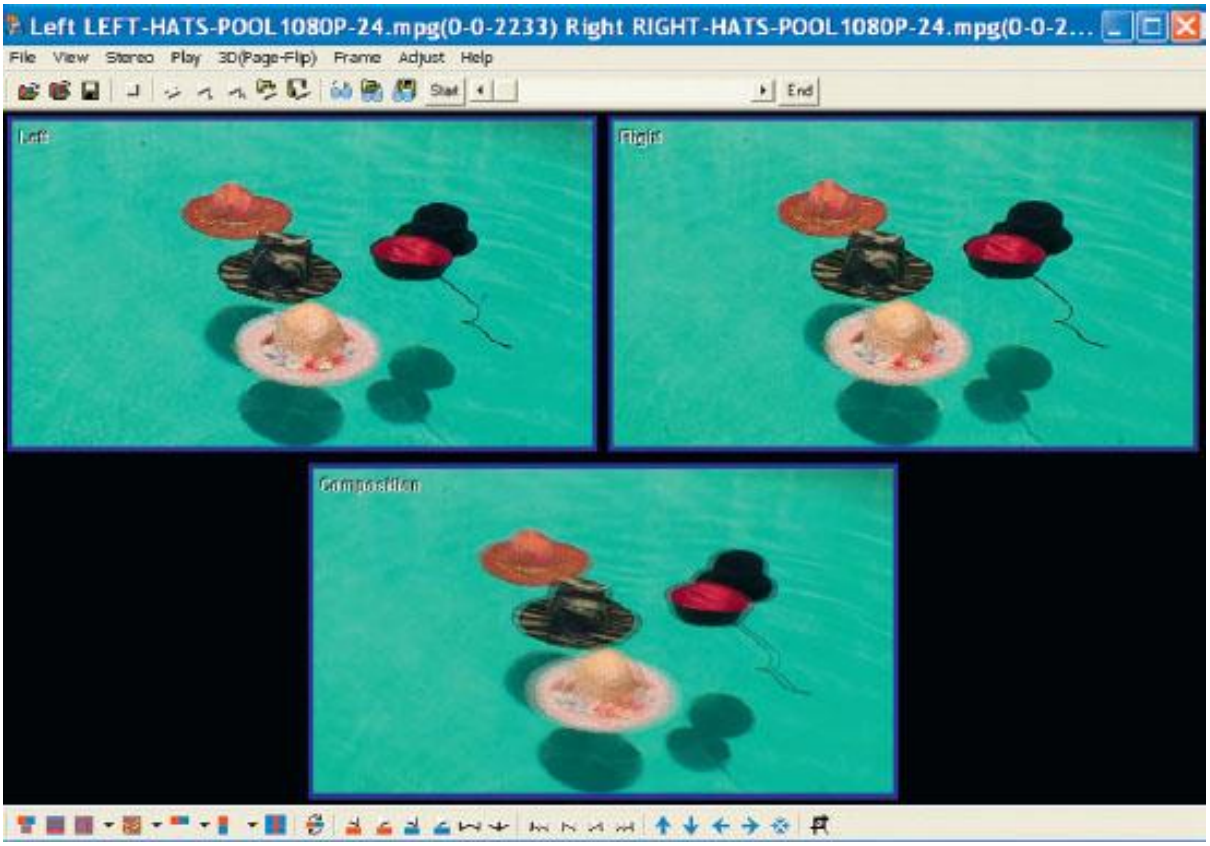

Figure 23.22 *A stereo pair of floating hats are shown, then the editing environment in which Razutis completes the work.*

Razutis is philosophical about the great variety of 3D toolsets that he has used to make his stereoscopic videos. “Everything I have used I consider substandard,” he said, “yet necessary and acceptable for the task at hand. Otherwise I wouldn’t have made and released the works. But what was substandard before becomes standard later through improvements to cameras and software. For example, the Fuji W1 of today is a far superior 3D camera than the Toshiba 3D camcorder of the 1990s. You can’t just wait for technology to be improved (or have a ‘crisis’) if you want to create with the substandard tools of the time. You have to create with the tools available and exhibit your works to a contemporary audience, and not wait for some future audience.”

Figure 23.23 *Razutis is philosophical about his 3D toolsets and will often mix and match technologies for a 3D production.*

Figure 23.24 *On a single tripod, Razutis has paired two HD cameras side by side with a Fuji W1 3D camera.*

Razutis's editing in the analog days was all tape to tape. He fast-forwarded to digital desktop and notebook editing after 1999. From capture to encoding, to editing, to compositing, to CG, to FX, to output and playback, the digital era has allowed Razutis to travel with computers, not playback decks, switchers, proc amps, and genlock boards. "That is an amazing change that all of us, I think, appreciate," said Razutis.

Razutis's first professional home workstation PC was a Windows 1 machine (DOS 3) with a monochrome display, 256k RAM, and 20 MB of hard drive space. Shortly afterward, the PC evolution took off. "I don't use Macs, so my software is everything and anything that will run on a PC," said Razutis. "I've used Adobe Premiere and After Effects for years in all kinds of versions, plus Photoshop and related programs, Flash, Virtual World building programs, 3ds Max, Vue, and Daz. I also use StereoMovie Maker and Stereoscopic Player to master for 3D Blu-ray and a variety of 3DTV formats."

Razutis hasn't assembled a 3D movie on tape since 1999, and he is still contemplating the future ramifications when holographic 3D movies are affordable for the home work station. "But that might take some time," he said, "so I'll relax for now. I work strictly with PCs, and in the past have worked with SGI machines on VR projects. The list of the software is constantly growing," said Razutis, "in terms of the number of preferred encoders, decoders, and stereo plug-ins for updated Premiere Pro software and modeling systems. Everything just keeps growing and changing for what we need to do to make 3D."

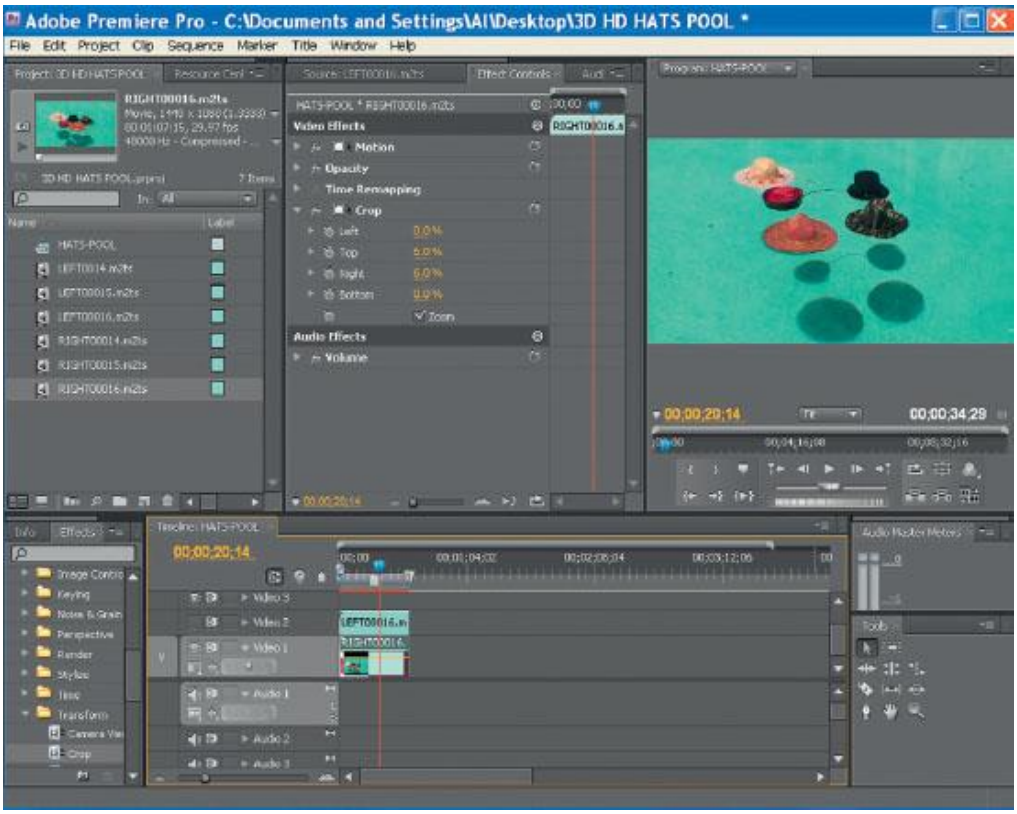

Figure 23.25 *Razutis edited his floating-hat video in Adobe Premiere.*

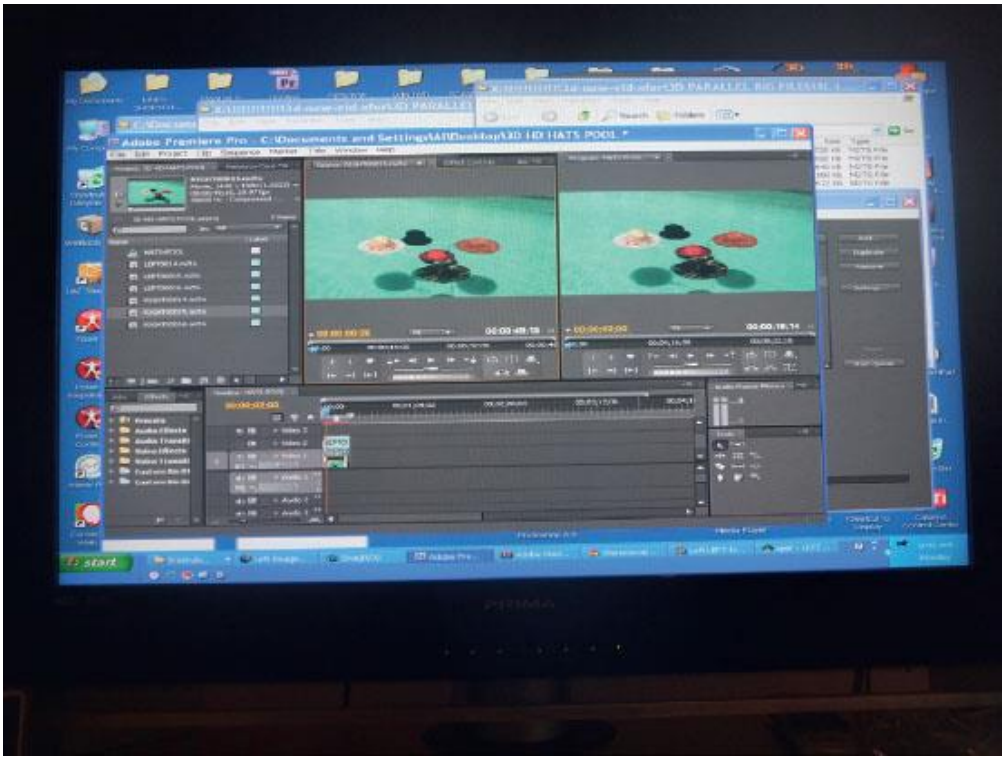

Figure 23.26 *The Premiere interface is shown with a stereo view of the floating hats.*

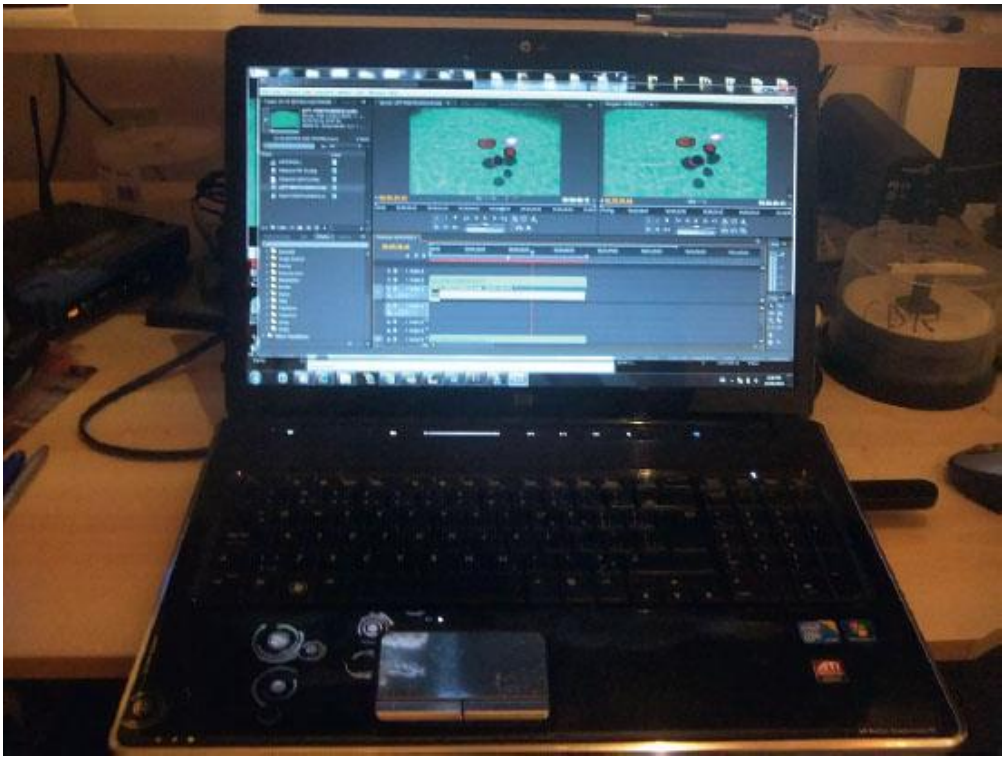

Figure 23.27 *Razutis enjoys using a portable editing studio with a laptop to edit the floating-hats 3D video.*

In the past, for Razutis, everything was dependent on the shooting and editing technologies available at the time. “I started way back in the 1970s with a single Bolex 16mm with intervalometer looking at monochrome (lines/frames, no textures) output from PDP1138 generation computers,” said Razutis. “In the 1990s I used 3D Studio Max and stereoscopic plug-ins, VRex for anaglyph, and After Effects, and had to output to tape and view in anaglyph. “In digital today, I simply render out left-eye and right-eye views and subject these files to encoding, editing, post FX, and output as HD over/under or a variety of formats suitable for 3DTV.”

With his Fuji W1 photography, Razutis shoots in tandem with HD 3D. Shooting independently for short subjects and experiments, previewing is made simple with an autostereo 3D LCD that is both useful and economical. The W3 has an improved 720p HD resolution and the autostereoscopic LCD is brighter and bigger. “All of this is available now for less than 500 bucks,” said Razutis. “The options are wide and available.”

At the moment, there are many techniques to use for real-time 3D viewing while editing. Razutis currently uses either anaglyph or autostereoscopic 3D viewing. “I use anaglyph when logging, assembling, and editing on my PC workstation viewed on a 32-inch LCD workstation. Autostereoscopic viewing is used to test results. But I’m looking into using a 3DTV with active glasses for all aspects of future editing, viewing, and presentation.”

Figure 23.28 *A green-screen setup with side-by-side cameras in the foreground shooting the actor in a mirror with a green-screen background.*

Razutis shoots with green-screen and does compositing in Adobe After Effects or Premiere. “This is a pretty straightforward and known technique and really depends on budget and lighting,” said Razutis. “The most recent green-screen shots that we did in 2010 in LA used available and borrowed screen material and lighting kits.”

Razutis will typically eyeball the parallax values for 3D while setting up the shot. In this way, he will determine where the stereo window will be relative to foreground and how deep the stereo scene should be for the shot. “In other words,” said Razutis, “I am prone to first construct the scene or arrange the scene for the camera and then make parallax adjustments and [stereo] window placement afterwards. I like utilizing varying convergences when I have control over background and depth of stereo scene. I also prefer engaging with the window, with images at time protruding through the window into the audience space. This is a matter of stereo aesthetics that is highly personal to me and not grounded in realism or orthostereo intentions.”

Razutis has concluded that the 1-to-30 rule is not an “aesthetic,” and he is interested in a dynamic space that is neither completely real nor completely synthetic in appearance. He will sometimes use onscreen transformations or transitions that point out the artificial nature of the space in view. “At times, cardboarding can be interesting to me,” he said, “and of course that results from a deliberate lens focal length setting, lighting, and convergence.” Razutis believes that stereoscopic 3D is neither natural nor magical, but a blend of the two, because it can refer to both worlds, the one in binocular perception of nature and the other in the world of dreams and impossibilities. “I don’t buy the ‘reality’ of stereoscopic 3D just like I couldn’t buy the ‘fidelity’ of holographic mimesis,” Razutis said. “I like that it can do both, in all kinds of interesting interpretations and expressions.”

Razutis is interested in both the near space in front of the zero parallax window and the virtual space behind it in the backgrounds. “Projecting an image ‘in front of the screen’ is no 3D gimmick to me,” he said. “We have been doing that in holography for years with image-plane holograms, pseudoscopic real image holograms, holograms using concave (pseudoscopic) mold subjects and plate-inverted holograms that project the image out of the plate in an orthoscopic view.” Holographic projections actually use a parabolic screen to float an image in space between the screen and viewer. “The subject of images projecting ‘in front of’ or ‘behind’ the screen (or holographic plate) has been one of the ongoing subjects in my works, beginning in the 1970s,” said Razutis.

Because Razutis has always acted as the stereo cinematographer and stereographer on his productions, he is flexible with all parallax issues, especially as they concern the subject matter and what he wants it to look like in stereoscopic 3D. “What I like and what other people like will have to be put to the audience test,” he said, “and will depend on what type of audience we are dealing with.”

Shooting analog 3D video, Razutis stored the work on ¾-inch U-matic, S-VHS, Digital8, or VHS. When shooting SD and HD 3D recently, he stored everything on 32GB SD flash memory cards. “When creating 3D CG, I use the internal hard drives on my PC,” he said. “I haven’t had to use external hard drives yet because I shoot short subjects, but obviously I intend to make longer subjects and will use any of the digital storage technology that is out there and affordable to me.”

Razutis edits one channel and conforms the second to the first for output. Editing is done in AVI with compression dependent on the capabilities of his workstations, which change and are currently quad-core and HD. Lower compression or uncompressed, of course, is best and it is a matter of storage space on hard drives that generally will determine the format.

“In present digital editing, I import the 3D material, whether it be separate-channel AVI or other camera formats with MPO files, and evaluate each shot using StereoMovie Maker and Stereoscopic Player,” said Razutis. “After evaluation, I edit a single channel and conform the second to the first for multiplexing or encode it to the requirements of the 3D TV—checkerboard, side by side, or over/under format.” In output and projection, Razutis has used separate left and right for dual projectors (interlaced 3D on DV tape or DVD (MPEG2) that is demultiplexed and sent to the projectors. In output to the Sharp autostereoscopic monitor, he previously output in interlaced form. “Since all viewing and projection systems and formats are changing,” said Razutis, “these formats will be determined by the end result and what system it is intended to run on.”

Razutis has looked at the finished work on laptop in anaglyph, on an autostereoscopic 3D monitor, in projection with passive linear polarized glasses, and on small and large silver screens in 3D. He recommends buying the right technology required to view the work in 3D. In some cases, Razutis borrowed the display technology, and other cases, the gallery or theater provided the technology. “Most often,” said Razutis, “I had to buy it, and am currently looking at buying a 3D TV plasma and certainly a DLP for fun and comparisons.”

In the “old days” of the 1990s, Razutis had to look at 3D movies on a CRT interlaced NTSC monitor using LC flicker glasses. “The flicker was annoying, the glasses a turn-off,” he said, “and a lot of discomfort occurred due to the glasses themselves.” Later designs with wireless and frequency-multiplied active eyewear improved the viewing experience. “My six-year-old autostereo Sharp is pretty awful in comparison to current autostereo screens,” said Razutis, “and I think the present autostereo monitors that I have seen are still inferior to the stereo quality of active glasses and 3D TV.” Razutis likes his work best when it is projected with two matched video projectors on a large silver screen with passive polarized glasses. With analog field-sequential 3D, he had to buy a demultiplexer (from Andrew Woods) and project the discrete left- and right-eye channels using a variety (Sharp, Barco) of matched video projectors. “That produced better results than using a single DLP (Micropol) VRex projector, which I saw employed by SCSC,” said Razutis. He has used anaglyph red-cyan, linear polarizer/silver screen, field-alternating LCS glasses, and autostereoscopic displays for presentations.

Razutis still believes that holographic motion pictures are on the way. “As one technology replaces another, there is a future technology called ‘holographics’ that is beyond the stereoscopic 3D of today,” he said. “The arts I’m interested in and practicing are not the determinations of whatever 3D technology there is at the time. I’ve learned that production and 3D is a function of what one wishes to ‘make.’

“If it is a work that is deemed interesting to the art culture and market, or if it is a work that is purely personal and to be shown amongst friends,” said Razutis, “then the production process becomes completely adaptive, sometimes innovative, and the 3D can be stretched and explored to the limits.” Visit Razutis’s website at http://www.alchemists.com/.