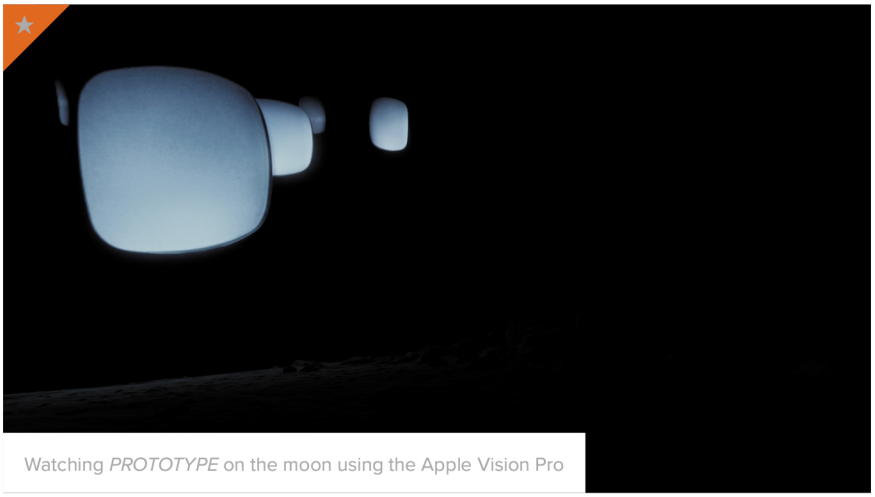
Streaming 3D on the Apple Vision Pro



Watching *PROTOTYPE* on the moon using the Apple Vision Pro

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In the first week of January, I received an email from a programming manager at MUBI—arguably, the leading global streaming platform for arthouse and independent cinema—telling me that the company was working on a new project that would allow it to present stereoscopic (3D) films on its service in the immediate future and asking about the availability of my films' materials and SVOD rights. Intrigued and perplexed, I verified that I had the rights to all of my solo projects and told MUBI it could include whatever it wanted. A week later, MUBI licensed non-exclusive U.S. and Canadian streaming rights to my full 3D catalog—namely, my debut feature, *PROTOTYPE* (2017); and my short films, *Laberint Sequences* (2023), *2008* (2019) and *Something Horizontal* (2015)—though I still had no idea how it planned to show them. Years ago, I'd tried in vain to offer some of my 3D films to MUBI and was told that the glasses requirement made the work too challenging to exhibit online. At that time, I was primarily working in the anaglyph 3D format, for which one only needs a pair of relatively cheap and accessible red and cyan paper glasses. Thus, it was more than a little mysterious to me that the company had figured out a presentation method that could somehow accommodate full 3D media, especially now that we're several years removed from 3D TVs being mass produced.

As my filmmaking practice has become more firmly committed to exploring stereoscopy, I've embraced my work's format specificity, admittedly to the point of pedantry. If you want to see

it, you have to see it in 3D. Otherwise, you haven't seen it. The work was conceived for 3D, shot on 3D camera rigs that I built with family members and edited in project files that were tediously modified to accommodate 3D materials—a workflow that absolutely shapes and informs the meaning, tone and flow of the final product. Losing the depth is one thing, but you can also strip away the presence of thought, the pace of contemplation, the impulses that prompted every decision. To encounter a flat version of my (or anyone's) natively shot 3D films would be akin to experiencing, for example, *The Wizard of Oz* (1939) on a black-and-white television: The moment Dorothy first steps out of her fallen house into Oz the information is apparent, but the reason is lost.

I don't like that my films are difficult, rare or expensive to see. When I've made 2D versions, it's always been for festival staff, who often insist on a flat version that they can screen for their selection committee. Absent any standard and ubiquitous way to get my work seen in 3D, I often rely on detailed written descriptions of what the film is supposed to be doing visually, which I attach to the synopsis of submission applications, and hope that this will communicate some inkling of what it's like to see my movies properly. When programmers are amenable to it, I've taken to mailing them anaglyph glasses so they can watch anaglyph conversions that I post for them on Vimeo; they shouldn't have to spend their money to consider my movies for their selection, and, compared to any spectacles they could expediently obtain, the glasses I have on hand have very strong color filters, which are important for mitigating crosstalk/ghosting—a technical artifact wherein one eye's image leaks into the other's field of vision, resulting in a kind of blurry double image. This effect, which is especially prominent in compositions that were graded to have higher contrast levels between lights and darks, is a pest that afflicts any anaglyph presentation and is the main reason I moved away from the format at the end of 2015.

For audiences, seeing my (or any independent filmmaker's) 3D work has usually meant catching it at a film festival. These tend to be in major cities (Toronto, New York City, Melbourne, Busan) and are generally limited to the very few that are interested in screening challenging non-narrative films for their audience *and* have access to a modernized venue (usually a multiplex) equipped to screen a 3D-DCP (i.e., they have a 3D projector with a system installed that requires some combination of lens filters, a special silver screen onto which to project the image and glasses with either polarized lenses, an active shutter or infrared emitters). Programmers are often unaware of the base technical requirements needed to exhibit this work; more than a few of my films have been formally invited to festivals or microcinemas before I was later asked what kind of glasses the screening venue needs to show them. (For full 3D films, if the venue has to ask, they almost certainly don't have a system installed that can show these films.) Invitations have been rescinded. In 2014, I showed up to the NYFF venue where the U.S. premiere of my anaglyph film, *Red Capriccio*, was to take place and was asked by one of the curators hours before the screening, for the first time, if I was going to supply glasses for the audience. Naively certain that the festival had that covered, I didn't bring any. Panic ensued, but all was soon well when a projectionist located a reserved stash of red and cyan spectacles in one of their stock rooms.

Outside their festival and repertory lives, my films have been obtainable in limited and niche capacities. In 2019, I successfully crowdsourced the money that allowed me to press 1,000 copies

(the minimum required by most production houses) of a 3D Blu-ray that included my films *PROTOTYPE* and *Something Horizontal*. (The films are both distributed by Grasshopper Film in the United States, but the commercial prospects for the disc were too meager for them to be able to fund the release themselves.) I've uploaded copies of my work to the private torrent tracker Karagarga in the Side-by-Side (3D-SBS) format, which most 3D TVs, projectors and VR headsets can easily unpack into a proper stereoscopic presentation. This format is also easily streamable because it's effectively a regular video like any other—you simply need to put your capable 3D display on the appropriate setting to see it. Indeed, between the 3D-SBS (or its alternative, Over-Under/OU) and anaglyph formats, any 3D film can be made available for home consumption in some form or another, the only requirement being a color display. Recently, Kino Lorber and other labels that release the 3-D Film Archive's vintage restorations on 3D Blu-ray have included anaglyph versions of films (with complimentary glasses) on their discs to make the films as accessible as possible, and I've long hoped that streamers like MUBI would follow suit.

Within two weeks of receiving the offer from MUBI to stream my work in its first ever 3D collection, I intuited that the endeavor was intended to correspond with the then-looming early February release of Apple's first extended reality (XR) device, the Vision Pro. The SVOD license began on February 1, the device was launching February 2 and I found a press release that listed MUBI alongside companies like Disney+, Max and Amazon Prime Video that were set to have apps on the Vision Pro. A member of MUBI's tech team reached out to me requesting materials, telling me that they would be encoding my films using a Dolby Vision profile on a cloud encoding service called Hybrik. This was because Apple had very specific codec specifications pertaining to a new format called MV-HEVC (Multiview High Efficiency Video Encoding). Distinct from other 3D video types like 3D-SBS, MV-HEVC stores a single track that contains multiple layers for the video so that the track and layers share a frame size. I was given a small list of guidelines for readying my materials: left and right eye sources must be separate videos, in the Apple ProRes 4444 format; both sources must have the exact same duration and frame rate; and the source formats must be HDR (High Dynamic Range). The latter was underlined as a potential issue.

"I would say my experience was religious," *Avatar* mastermind James Cameron told *Vanity Fair* for its February 2024 story about the Vision Pro. Announced on June 5, 2023 before finally launching nearly eight months later, the wearable computer uses a mixed reality OS to virtually superimpose apps and media windows onto users' surroundings. Eschewing many of the features that would qualify the Vision Pro as a virtual reality (VR) platform, Apple CEO Tim Cook and co. devised the headset as a new, more expanded and immersive way for consumers to engage with the tools and media they already use, watch and listen to on their desktop and mobile devices. Rather than being placed in an entirely fabricated space, we interact with an interface that situates us amongst our email inboxes, social media feeds, family photos and web browsers in the spaces we actually inhabit, resuscitating convergence culture's final fantasy of a seamless interconnection between our virtual, technological and IRL tasks—already promised and fumbled by Google Glass a decade prior.

It has quickly become quite clear that the Vision Pro's ultimate success will rest on Apple resolving early comfort complaints, not

to mention lowering the price tag beneath the luxury threshold (its introductory model currently costs U.S. $3,499, equal to the combined cost of a new 8-core iMac, 14-inch MacBook Pro and 256GB Mac Mini). That said, the product has nevertheless earned substantial early praise for the ways it expands the possibilities of home entertainment, especially watching movies and, in particular, 3D content. Pointing out that he is “someone who has worked in VR for 18 years,” Cameron emphasized that the Vision Pro compresses “the equivalent of the resolution of a 75-inch TV into each of your eyeballs—23 million pixels” (compared to the approximately eight million that go into the average 4K display). The filmmaker went so far as to proclaim the product as “revolutionary,” one that—at least for media consumption—“solves every problem.”

When I woke up on launch day, MUBI’s 3D collection was live. It included my four films and one other film, the 2013 airline catastrophe picture *Charlie Victor Romeo* (directed by Robert Berger, Patrick Daniels and Karlyn Michelson). I boosted the unveiling on my social media accounts but was soon asked by MUBI to delete my posts because the collection had to be taken offline due to technical difficulties. Turns out, Apple’s stipulation that films be processed for HDR, even if they were originally made in SDR (Standard Dynamic Range), caused all kinds of wonky results in the conversion encodes; specifically, many of the films’ brightness levels were being blown out. Apple had seemingly only approached MUBI about including 3D movies on its Vision Pro app roughly one month before launch, and there wasn’t enough time to fully troubleshoot the encoding process by the release date.

Beyond being a novel media consumption device, the Vision Pro is also a 3D camera capable of capturing point-of-view (POV) “spatial videos” (Apple jargon for 3D moving images). While the camera specs are fairly restricted—videos come in a square native resolution of 2200 x 2200, moving at a frame rate of 30 fps—the interocular distance of the left and right cameras is more or less exactly aligned with the average human head. This is a hell of a lot further apart than most 3D cameras that have hit the market this century, and it results in 3D video that has actual, discernible volume—far from the timid “shadow box” effect seen in a majority of 21st century 3D productions. My next film calls for a significant amount of POV 3D footage, so I joined the pre-order queue for Vision Pro and had mine in hand by the middle of March for test runs and experimentation.

Watching movies on the Vision Pro is, as promised, impressive. I already had some prior experience with watching films on the Oculus Quest 2 and the Meta Quest 3, so I was familiar with the way VR media players are able to simulate the sensation of watching movies on a large screen in a cinema auditorium. The Vision Pro does this, too, and much better. The viewing environments, which range from minimally decorated movie theaters to the white sands in New Mexico to the surface of the moon, are credible and genuinely transportive, and the higher resolution displays for each eye take full advantage of the current standards for video quality (though I would love if some of the third-party media apps, like the Cinemax and Moon VR players, could eliminate the pixelated jaggies at the edge of the frame). My main initial complaint was, indeed, the weight of the device, especially due to the pressure it placed on my nose and cheekbones. However, after switching out the default Solo Knit head strap for the infinitely more comfortable Dual Loop Band option included in the box, I was able to wear the Vision Pro for

up to three consecutive hours at a time before needing a break (compared to less than half an hour with the Solo Knit band).

Without finishing any of them, I spent a few days sampling the 3D movies that were available in the Apple TV store. Free titles at the time included Alfonso Cuarón's *Gravity* (2013), both *Avatar* (2009) and *Avatar: The Way of Water* (2022 and, amazingly, offered in high frame rate [HFR] 3D), and the post-conversion of George Miller's *Mad Max: Fury Road* (2015). All of them looked and felt nearly as good as when I saw them projected in the cinema, sans the communal atmosphere of watching them with neighboring strangers (for better or worse). Eventually, these free titles all became pay-per-rent (often $3.99 for 48 hours) or purchase only (from $9.99 to $14.99) and, at the time of writing, there are no free 3D movies in the Apple store. Within the Max app, all movies are only available in flat versions, including *Avatar*, while the Disney+ app's 3D library is almost entirely populated by Pixar animations and Marvel blockbusters. In general, the selection of 3D films in the mainstream streaming apps is immensely underwhelming. Of the 280 currently available, only four are vintage titles (Jack Arnold's *Creature from the Black Lagoon* [1954], Raoul Walsh's *Gun Fury* [1953], Alfred Hitchcock's *Dial M for Murder* [1954] and Curtis Bernhardt's *Miss Sadie Thompson* [1953]), while I'd estimate that more than 90 percent of the new films across all platforms are post-conversions that weren't shot in native 3D. Once again given a chance to win over new fans of the format, leave it to the studios to foreground their least convincing material. That said, credit where it's due: *Jackass 3D*, never released on physical media in full 3D, is available for rent or purchase, and looks as maximally abject as ever.

Without getting into the details, the February 2 launch of MUBI's 3D collection was delayed to early May, when it was quietly unlocked with only *Charlie Victor Romeo* and one new addition: *Pina*, Wim Wenders's 2011 documentary about the work of German dancer and choreographer Pina Bausch. In May, MUBI began trialing a new company that offers SDR encoding for the MV-HEVC codec, which would allow it to bypass the crass SDR-to-HDR conversions it had been forced to attempt for months. After some success, MUBI spent several more weeks using this process to re-encode all of its 3D titles for its platform. The 3D collection was made available on MUBI's Vision Pro app on July 3, 2024, and the encodes of my films look as good as I think they possibly could. Watching *PROTOTYPE* and *Laberint Sequences* on the dark side of the moon—only occasionally looking up from the screen to look at Earth—is a treat, and *Something Horizontal* on a nine-foot-tall window in the middle of my living room was dutifully overpowering, even as ambient lighting stunted some of the film's more visually assaultive moments. On that note, I don't love that movies in the MUBI app currently can't be viewed in the standard virtual cinema space that movies in the Apple TV store can. The nighttime outdoor environments are sufficiently dark and distraction-free, but the spectacle of being encompassed by faux nature is a decorative supplement that isn't always welcome.

XR headsets are in certain ways the ideal devices for viewing stereoscopic movies. The essential nature of the apparatus, which completely isolates both eyes' views, eliminates any potential for crosstalk and thus, also, most causes of "3D headaches." Regardless of the format (anaglyph or polarized, active or passive), if you're watching a 3D movie by wearing glasses and looking at a screen, you will almost certainly, in at least a few moments, be able to detect these dreaded, ghostly double-images that drive most 3D aficionados mad. VR and

mixed reality headsets like the Vision Pro solve this; the eyes can only possibly see their own channels, and the resulting 3D is perfect, even in shots with extreme binocular disparity.

Yet, there are some drawbacks. For one, the complete isolation noted above can overemphasize some extremities in a stroboscopic image. My short film *2008*, for instance, is filled with shots that have quite distinct activity happening in each eye at a given moment. Because the material was re-photographed from a cathode-ray tube (CRT) television monitor, there was some inherent (and intentional) flutter in the footage due to the incompatibility of my cameras' shutter angle and the screen's refresh rate. The resultant flicker appears in varying degrees of intensity in each eye, but, when viewed on a 3D TV or projector, these flicker discrepancies register quite subtly, consciously and physiologically. On the Vision Pro, however, every discordance is pronounced, and I would be lying if I said I don't find the experience a bit nauseating. Another issue pertaining to refresh rates: Most movies were shot at 24 fps, while the Vision Pro's refresh rate sits at 90 Hz. Apple developers claim that this gets automatically bumped up to 96 Hz when viewing 24 fps video in order to achieve a clean multiple—every frame shows exactly four times—but the result is imperfect, most notably in panning shots. Alas, my short film *Laberint Sequences* is dominated by rapid pans. Projected in a cinema, these shots look remarkably smooth; on the Vision Pro (and the Meta Quest 3, which I also used to watch the film), most of them are rendered into stutter-y blurs.

Then, there is the seclusive nature of this mode of viewing. Call me old-fashioned, but I still think art is best enjoyed communally. Asked at a screening of *PROTOTYPE* at the Vancouver International Film Festival in 2017 what I thought about VR, I delivered my standard response, which is that I think it's a fundamentally distinct medium from cinema, not only because the medium dispenses with montage (the cut is replaced by the redirection of the user's gaze), but because each experience is a singular encounter with a work, not sharable by or with anyone else. I don't live alone, and when I watch a movie in my home theater, I personally get great value from sharing that activity with others. My response to films is always informed by my detection of the simultaneous responses of others around me, which not only makes each of my viewings unique, dynamic and unpredictable, but is also a consistent reminder that much of art's affective capacities are fundamentally vicarious.

For whatever benefits the Vision Pro introduces to the world (I will say, it's made long-haul flights much more tolerable), if headset viewing is to take hold of the home theater market, it'll be because it develops its own essentialism—which is to say, it will become necessary through the content made expressly for it. I'm not a gamer, so for me the killer app on this thing is unquestionably the Immersive Video page within the Apple TV app, where you can watch, for example, a short featurette allowing you to feel as though you're highlining with Faith Dickey above Norway's fjords, which feels like watching IMAX 3D on steroids—the myth of total cinema resurrected at last and again. Until that revolution arrives (i.e., becomes accessible to actual artists), I'll keep Apple's dystopian utopia—envisioning and marketing a world where we're all satisfied with interacting with holograms of people, things and lives we'll half remember—at arm's length. Though, I suppose if I must become stuck in my own head, I can think of worse fates than watching 3D art movies under the stars on Haleakalā.