

Platform Constructs And Imaginaries: On the making of *The Key To Time*, a work for 360 degree cinema, VR, domes and CAVEs.

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## Introduction

This paper discusses ways that concepts of time, space and narrative in *The Key To Time* <https://unknownterritories.org/keytotime/> and the short musical extract *Meet Me At The Station* are expressed through a mixing of technologies. Particular attention given to the impact of differing platforms upon language, story, genre and user experience.



Figure 1. Tanek inside a clock. The spherical image design in equirectangular form

*The Key To Time* is a surreal and lyrical work for group immersive environments such as domes (Figure 12) and 360 degree cinemas as well as for individual viewing on head-mounted virtual reality head-mounted displays (VR HMDs). Bridging 1920's silent film and virtual reality, the surface story draws viewers into a playful exploration of genre, identity and desire. In doing so, the work unravels narrative underpinnings of myths, genres, and technological constructs of time.

Created as a collaboration between media artist/filmmaker Roderick Coover (FR/US) and composer Krzysztof Wólek (PL), *The Key To Time* was part of a program designed to build cross-cultural, composer-artist collaborations. The dreamlike story follows a scientist who is trapped in the future due to a time-travel experiment gone wrong. His only hope to escape his predicament is to travel through dreams. His dreams, however, are troubled by anxieties, fears and anger. As the scientist travels through time, aesthetics shift from those of silent film of the early 20th century to those of VR and a future cinema. There is also slippage between these time periods and their technologically determined forms of presentation. For example, figures from black and white memories walk into color settings as black and white figures or cartoon ones. Visual references reframe iconic images of early cinematic works like Louis Lumiere's *Arrival of a Train at Ciotat* (1895) and Fritz Lang's *Metropolis* (1927) using temporal and perspectival distortions.

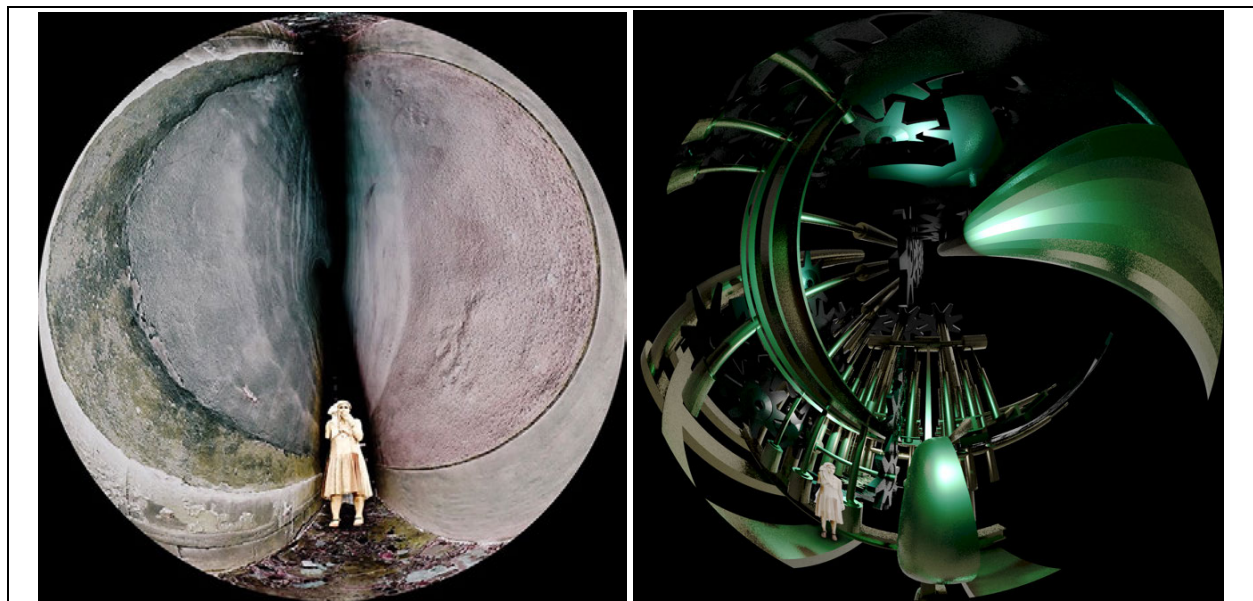


Figure 2. Two dome images: Anna calling to Tanek and Anna in a clock. The full dome format is designed for 180 degree projection, with a 37 degree tilt optimized for planetarium seating.

*The Key To Time* is one of three projects sponsored by the IAM Mickiewicz Institute project +100: *Three Works That Envision The Emerging Avant-Garde*, which was designed to bring together artists and composers from differing countries who were working on the cutting edge of art, sound and technology. Marek Chołoniewski (PL) and Chris Cutler (UK) created music

performances in which brain activity of the performers, registered live through EEG sensors, is projected as a virtual model of a floating brain in a collage of graphic forms, photos, videos and microscopic scans of tissues, including human tissues. Piotr Wyrzykowski (PL) and Echo Ho's (DE/CN) project *Temporary Nation* turned smartphones into sound- and light-emitting instruments; using phones, audience members become participants in a collectively-generated performance. In *The Key To Time*, cinematic production in VR combines with electronic sound composition and algorithmic methods of creative production.



*Figure 3. Anna in the zoetrope.*

The action for *Th Key To Time* was filmed at the Audio Visual Technology Center (CeTA) in Wrocław, which stands on the site of the historic film studio, Wrocław Feature Film Studio. A major center of vanguard film production in Poland, Wrocław Feature Film Studio was home to the production of works such as Wojciech Jerzy Has' *Saragossa Manuscript* (1964), Andrzej Wajda's *Ashes and Diamonds* (1958) and Roman Polanski's *Knife in the Water* (1962). In 2011, the studios were revitalized as the Audiovisual Technology Center. The center covers over 8500 square meters of space including the largest universal greenbox studio in Poland with the surface



of 330 square meters as well as an impressive bluebox studio. The history of the studio as well as the production conditions made it ideal for this project about cinema and its evolving forms.

### **Platform Creation**

The images are created using a range of technologies with live-action super-imposed on natural and created settings. Many of the settings and many images used in montage sequences were filmed using the 8K 3D 360 degree Instapro VR camera and others 4K VR images were filmed using the waterproof Garmin Virb. Virtual settings were created on computer using the open source 3D creation Blender, and most of the live-action occurs in the Blender-created settings. The live-action filmed in the green studio was filmed using 4k Sony FS7 video cameras. Two cameras were aligned side by side to create 3D images to be superimposed upon the settings. Images recorded using panoramic photography devices were adapted and animated. Many other images were created from non-VR imagery using post-production tools and animation.



*Figure 4. Travel through a wormhole.*

Images filmed and photographed on digital single-lens reflex cameras (DSLRs) were geometrically contorted to be recognizable as components in equirectangular images that

contain a full 360 degree data in a 2:1 ratio flat image. Post-production software was used not only to create, alter, blend, animate and edit these images, but also to introduce perspectival distortions that might illuminate ways differing technologies like video and VR construct time and space.

Each of the technologies shaped how the work was imagined and made. For example, Blender's design elements led us to veer toward aesthetics of animation and graphic novel for several of the action scenes which then encouraged the introduction of other graphic elements such as on screen text and heightened color contrasts. As the Instapro 8k camera proved to be poor in low light setting and at distance, shots using that camera needed to be quite close, while other VR image was therefore mostly created through the distortion layering and composition of non-VR materials using a VR perspectival mesh.



*Figure 5. Anna taking off her glove.*

Creators and body actors met at TR Theater to rehearse in Warsaw, Poland, then convened in Wroclaw, Poland, to film in the CeTA green studios during a 6 day period. The director, composer and voice-over actor participated in live recording sessions using Skype, with the actual audio being recorded primarily in Louisville, Kentucky. Post-production then entailed

considerable moving back and forth between PC and Mac, with blender based imagery being rendered on Amiga computers and much of the project being compiled on Mac with After Effects. Due to the long renders required for 8k 3D images, often several computers were in use simultaneously. The use of pre-renders (as well as proxies) were essential in maintaining workflow.



*Figure 6. Director Roderick Coover with actors Natalia Kalita and Paweł Smagała during production in the CeTA greenbox studio. Green tape on the floor indicates doorways, passages, or objects. Each must be calibrated to the choice of lens and camera placement based on initial designs.*

The choice of presentations platforms also shaped production choices. The more visually detailed, longer-length work, which relies on a minimum 8K 3D resolution (7680px x 7680px) was best suited for large-scale settings like, 360 cinema and dome settings. Different versions with some perspectival shifts and simplification of graphics were designed for VR HMDs. For example, some of the soft dissolves and light-play we were trying in 8k 3D format simply didn't provide the same effect in VR for example and this altered choices in how such imagery or substitute materials might connect to the sound and narrative. The dream-like narrative allowed for such



substitutions and perhaps at times even benefited from them in the context of the new versions that were created.

As an art project created on a micro-budget, *The Key To Time* relied on collaborations and innovation to make the most of the exciting technological opportunities of the emerging media forms we were using and of the facilities at CeTA without the costs normally associated with studio-based film production. This was achieved through partnerships with CeTA, TR Theater and others, the participation of students and interns, other kinds of support from Temple University and Louisville University, and a creative approach that embraced the limitations by emphasizing fragmentation, ruptures, aesthetic contrasts, and shifts in representational forms. The work includes performances by Joanna Freszel, Emily Albrink, Katherine Calcamuggio, Chad Sloan, Jesse Donner, Natalia Kalita and Paweł Smagała.



*Figure 7. Preparing for the greenbox recording of Tanek crouching in front of a bush which is actively layered upon a working model of the space. The conditions of product lead to a separation of action and setting – of time and place. The model for the setting will later be designed and textured. The model also leads one to explore how action elements can be transposed onto differing settings or transformed through manipulations of speed, color, etc.*

## **Sound-image Design And Production**

Whereas in many films, sound composition comes after the film is written, shot and edited, in this case the music was part of the process of invention rather than an afterthought. The audio recording of the script preceded the action filming, which is a workflow more common in animation, while the action-sequences were filmed without sound. This decision, which suited the platforms we were working with, allowed for lots of play between dialog, images and sounds and propelled us to making connections between silent or nonsync-sound film and radio drama. It also was prudent in removing limitations and costs that would be doing sound recording in the green box studio, as using microphone in 360 degree filming posing numerous practical problems.

The separation of sound and image adds to the surreality, allow for differing kinds of word play and interiority. The surreal structure and narrative changes are driven by emotion, impulse and concealed themes. Music is effective in evoking these impulses. Five songs were at the center of design and in some cases, script elements were built around them in a fragmentary form after which processes of layering and interconnection took place.

Several experimental approaches were used. For example, some of the songs and connecting elements were imagined as potential parts of a combinatorial system, driven by algorithms that might shuffle sounds, images and even whole scenes. In such systems, no two versions are the same. Although, in the end, we did not use an algorithmic system, the combinatorial concept shaped the creative approach and logic. Second, we decided to record the script in advance of shooting the film. This decision enhanced a creative freedom and allowed for lots of play between dialog, images and sounds. The result disconnect between voice and image is evocative of early film and radio drama, and the approach is also similar to a workflow frequently used in animation.

The lyrical elements -- songs and poetically constructed vocal sequences -- provide psychological and emotional expression. For example, the opening tone is partially created through distant marine weather reports that fade in and out. The reports echo Tanek's psychological state of anxiety and confusion. An early report announces:



*Viking: westerly winds about 3, increasing a little, snow squalls, swell 2,5 meters and rising. Skagerrak: northeast to east about 5, decreasing then rising, gales then not. Quiet, shifting southeast to south, locally misty, sea 4 meters and sagging.*

Soon, reports announce war, environmental contamination, floods and death:

*Dover, Wight, Portland, Plymouth: West. Cyclonic storm force 10. Rough, occasionally very rough in Portland and Plymouth. Rain, becoming wintry later. Bombing predicted 400 UTC to 800 UTC. Severe. Shannon, Rockall: West or northwest 6 to gale 8, increasing severe gale 9 for a time in Rockall. Severe conditions. Implosions, contamination. Risk of death. Malin: Northwest 5 or 6 backing west 6 to gale 8, perhaps severe gale 9 later. Severe conditions. No known survivors... Parnu, Gdansk: Code Red. Severe contamination. Contact lost. All believed dead. Ristna, Helsinki. Code Red. Severe Conditions. Contact lost. Skagerrak, Narva. Sever Conditions. Contact lost.... Malin, Gone. Amsterdam. Gone. Hamburg. Gone. Gdansk. Gone.*

This play on technology, psychology and story unfolds more elaborately in "The Time Song". This music sequence focuses on the speaking clock, a 20th Century technology with which, once upon a time, an individual could dial a telephone number to hear a mechanical voice telling the current time. In this version, based on a text by Deb Olin Unferth, the speaking clock is a technology gone wrong. In its terrifyingly insistent, forward motion, its language exposes an aggression and chaos that reflect Tanek's inner anxieties. The clock implodes in its attempt to fulfil the structure to which it is programed. Here is a small excerpt:

*At the tone. The time will be. Now the time. Will be two. Now the time will be one. Now the time will be. One now. One. Now one. Now the time will be. Exactly. At the tone. One now. At the tone, and seconds. Now the time and. The ten will be. Seconds. And seconds. And five. And four. And three. Stroking two. Now four. Now three. Now there. The time. Will be there. And then. The time has been. And been. And was. And went. It went the time. And at the tone. The time. The two. The one. And four. The second. The was. The will. The be. The time. The seconds. The*

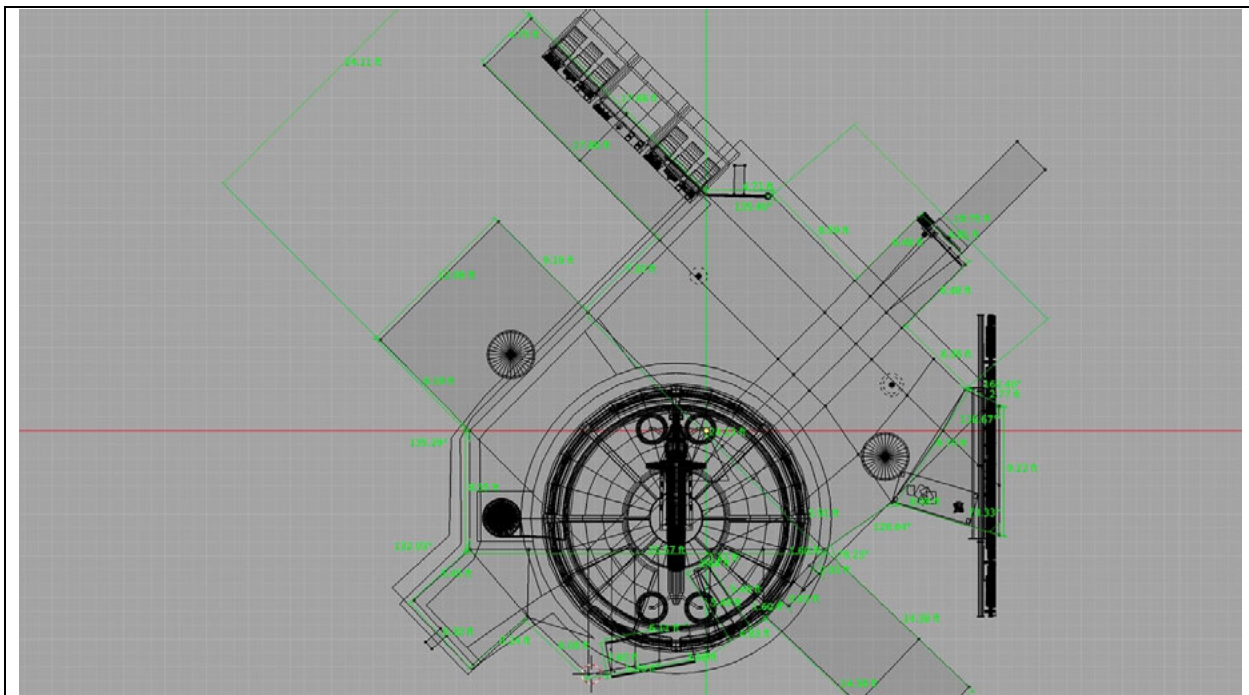
*seconds. The time will. The time will. The time. The now. And now. The time will be. And now. The time will be. At the tone. Another. Another. Another. Exactly.*

In the spirit of silent film, the film also includes many intertitles. These are sometimes written, sometimes spoken or sometimes both written and spoken. The narrator's feminine voice becomes an additional character in the narrative, teasing Tanek and egging him along. Here is a sample in which Tanek makes his first attempt to travel through dreams:

*Narration #9, title and voice:* The only way to send a message to Anna is through a Dream.

*Narration #10, title and voice:* Send a dream to Anna to meet at the station! Wasn't she meant to meet him there before - So hard to remember

*Narration #11, voice only, no title card:* Remember, Tanek, remember.



*Figure 8.* Observatory design in preparation for creating a virtual environment in Blend and shooting action sequences in the green box studio.

While the sound was being recorded in Louisville by Krzysztof Wolek, in Philadelphia, Logan Gardner worked with Coover to design the virtual environments in Blender and make the measurements for the shoot in the green box studio. Having correct measurements was vital to

be able to accurately mark out the spaces on the floor of the studio using green tape so actors would know where to move and so the cameras could be correctly placed to ensure the actions and designed backgrounds would line up. The designs included both simple block models for preparing the staging and camera angles, and, with time, more elaborate designs with texturing. Several settings were made with reference to specific films and works of art. For example, the bar in the factory space references Edward Hopper's 1942 painting, "Nighthawks". These references help signal genre slippage and confusions of signification, as if, in the dreamlike world, the protagonist is thrown from one genre to another, causing shifts of context and interpretation.

### **Filming in the greenbox studio**

For the action filming, the team designed a 3-D rig using two Sony FS7 video cameras joined on a metal bar. The handmade rig provided stereoscopic image that could then be layered upon the 360-degree image using a plane-to-sphere image conversion tool. For this to work, the positions of the characters had to be calculated precisely. The calculations were based on the use of prime lenses. Most scenes were shot using 35mm or 50mm prime lenses. During shooting we verified the match, such as in this scene in which the doppelgänger was going to be crouching near a bush. See *Figure 7*.

The project uses a mix of images recorded in natural settings and those created using digital design tools. The scenes for human action that are created in Blender® include the observatory, the station, a meeting point in the tunnels, and the interior bar and tunnels of the old factory as well as the insides of the clocks (*Figure 1*) and zoetropes (*Figure 3*). Some other experiences are also created in Blender® such as watching a passing train and flying through a wormhole (*Figure 4*).

Other scenes are layered upon seemingly natural settings and natural elements are layered upon and within images. For example, *Figure 5* is a frame from a scene in which Anna removes her glove to reveal her strange, glass arm. The background image uses VR video filmed near a military bunker, and the image is altered for color. The image of Anna, which was filmed in the greenbox, and the arm, which was rendered in Blender®, are combined and placed upon the background. Shadows are added to her clothes and the ground around her.

The "Story Of Anna's Arm", which is a film within the film, offers another example. The silent film appears as a screen within the VR environment and has musical accompaniment and intertitles. The actions, filmed in the green box studio, are layered upon the photograph of a lab (Figure 9 and Figure 10). In this scene, Tanek is helping his stepfather to create a time-travel machine. The stepfather eyes a budding romance taking place between Tanek and his daughter Anna and is filled with rage. When Tanek is late for experiment, the father uses Anna for the experiment instead. The room needed to be photographed from several angles to match the differing angles that would be used in the action shoot. The image was desaturated. Flicker and dust were added and Anna's blood was colored red. The scene ends with the father inventing the special glass arm for Anna, and the scene changes from 2-D to 3-D.

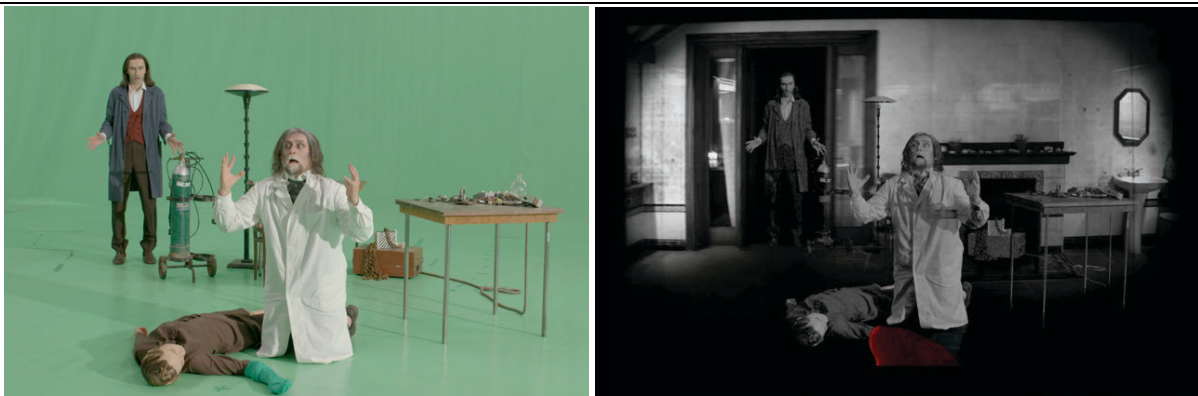


Figure 9 (left). Tanek walks into his stepfather's lab just after Anna's arm has been blown off, shown both the green box original and the layered and painted film image. Figure 10 (right). The same image with background and coloring.

Additionally, there are outer space sequences that incorporate photographs from NASA that have been altered, collaged and animated. There are also objects drawn or fabricated from historic and cinematic references. For example, one object resembles the box that plays a dominant role of desire and abandonment in Luis Buñuel and Salvadore Dali's film, *The Andalusian Dog* (1929), and a snowdome references the famous object of memory and loss in Orson Welles' film, *Citizen Kane* (1941). Throughout *The Key To Time*, Tanek is either en route to or at a train station; aspects of the station design are adapted for the representation of the train



station in Ciotat in Louis Lumiere's famous film *Arrival of a Train at Ciotat* (1895) in which a train appears to be coming toward the audience as it arrives at a station.



<https://vimeo.com/438841198>

Figure 11. Video Sample, *Meet Me At The Station* is an excerpt from *The Key To Time* featuring the *Time Song* of a speaking clock gone wrong.

## Conclusion

*The Key To Time* combines elements created using multiple technologies and was designed for output for differing presentation platforms. Applying questions early expressionist film to VR, *The Key To Time* explores ways that gesture and design can express emotional tensions between subject and object. In drawing upon early surrealist film, *The Key To Time* uses the VR experience to question how the meanings of objects and actions relate to their surroundings or to the surface narratives in which they are encountered. By turning attention to the apparatus of cinema, *The Key To Time* asks how cinematic, immersive technologies and their constructs of time may work upon the imagination.

The dreamlike narrative structure was well suited to allowing for a playful exploration of these technologies, which propelled aesthetic shifts and both opened, and closed, differing paths for the story. Sifting between technologies and their platforms both in production and presentation enabled a play with genres and forms such as those of science fiction, surrealism, expressionism, opera, silent film and graphic novel. The more visually detailed, longer-length work, which relies on a minimum 8K 3D resolution was best suited for large-scale settings with live audiences and different shorter versions with some perspectival shifts and simplification of graphics were designed for VR HMDs. The play between VR and cinematic forms was enhanced by movements between platforms in preproduction, production and presentation. In doing so the experience poses fundamental questions about ways that differing technologies frame expressions of narrative events.



*Figure 12. The Key To Time at Rauch Planetarium, Louisville, Kentucky.*

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<https://unknownterritories.org/keytotime/>