Abstract. Backlit animation capitalizes on the purity of light pouring directly into the camera and no technique maximizes the nuances of that light better than sand animation. This paper will discuss the historical variations on sand animation, the physical properties of the material that result in typical movement patterns, and the contemporary evolution of the technique that break from the historical trends, due to the adoption of digital capture and compositing.

Keywords: sand animation, hybrid animation, stopmotion, fluid frames

1 Introduction

The mysterious art of powder animation is a technique to which I have deep personal connections as a practitioner, and one which represents the broader global trends of hybridization and handcrafted process in the animation field. This adoption of hybridity has brought a renewed interest to the technique, both for animator and for audiences. In this paper, I will give a brief overview of the technique and the common traits seen in historical and contemporary films that find their source in the unique properties of powdered material such as sand, salt, coffee and other dusts. Then I will discuss contemporary trends in the practice of this technique, based on new technology and accessibility. On occasion, I will speak generally about “sand animation” since this is the most common material in use, but the observations and conclusions apply to all powders used under the camera. The source of this research is from my own practice as an independent filmmaker cross-referenced with historical investigation and interviews with contemporary artists practicing powder animation techniques. Further discussion of the production process within the historical and contemporary context of landmarks films can be found in my book Fluid Frames: Experimental Animation with Sand, Clay, Paint, and Pixels (CRC Press, 2016).

2 Common Aesthetic Traits of Sand Animation

First, a brief overview of the technique as it has been and is practiced by animators. In the sand animation studio, you will most often find a light table with the sand (or salt, or
A camera mounted above the light table captures images as the animator moves the material in a stop-frame method. Most animators today will use a frame capture program such as Dragonframe to capture and review the animation as they are producing it. An animator will use a variety of tools to create the images, paint brushes, sieves, feathers, pointed sticks, and cone-shaped tubes, but the most important tool is the hands. Touching the sand provides an immediate connection with the material, its volume, its texture, its warmth from the light below, create an atmosphere of creative flow, opening the mind to experimentation, flexibility and risk-tolerance. This experimental frame of mind, catalyzed from the physical qualities of the material, ultimately gives rise to some of the common aesthetic traits we see both in historic powder animation films and in contemporary practice.

A survey of historical sand animation will show some of these common traits while also exhibiting the stylistic variances between different artists. The first common trait is the dominance of monochromatic imagery. Looking at work by sand pioneers from the 1970s, Nag and Gisèle Ansorge from Switzerland, Caroline Leaf and Eli Noyes, from the United States, one can see an almost exclusive use of black and white design within their varied personal styles. Later in their career, the Ansorges experimented with colored gels for backgrounds in *Le Chat* (1975), a technique we also see in Richard Quade's film *Sand Dance* (1988). Polish animator Aleksandra Korejwo developed a method of animating with colored salt, but the majority of powder animation films, even those created after the widespread adoption of digital post-production, are monochromatic.

A determining factor in this monochromatic approach is that sand is most often a silhouette technique. In fact, one of the first documented uses of sand was in Lotte Reiniger's *The Adventures of Prince Achmed* (1926). Walter Ruttman used sand to create special effects and transformations behind Reiniger's animated paper cut-outs, evidenced in what is most likely a staged but nonetheless informative photograph of the production.[1] In this studio shot, Reiniger poses animating cut-outs on the upper level of a room-sized multiplane, while Ruttman manipulates piles of sand with a large brush on a lower level of the multi-plane, with Karl Koch operating the camera in the background. In viewing the title sequence of *The Adventures of Prince Achmed*, a trained eye will recognize the swirling shapes behind the cut-out characters as piles of sand flattened into a two-dimensional silhouette. Because there is a physical amount of material on the glass, the artist can act as a sculpture, manipulate its volume, piling it up and spreading it thin. The form of this three-dimensional pile becomes flat when photographed, allowing for strong silhouettes and fluidly morphing shapes.

This physically transformative method of animating invites certain thematic elements to arise. Because the resulting sequence of images is one continuous evolution, we often see a stream-of-consciousness approach to the narrative structure. This is particularly evident in many of the Ansorge's films, in which fantastic creatures and surreal environments are connected through morphs and simple movements. In their working relationship, Gisèle primarily manipulated the sand on a multiplane while Nag operated the camera and took care of the editing, Gisèle's masterful command of the material combined with an unabashed approach to unconventional narrative led to films that explored the inner psyche of their relationship and philosophy.[2]

Hungarian animator Ferenc Cakó also uses transformations to great effect in his philosophical films on the human condition. In *Ab Ovo*, (1987) and *Nest* (1997) Cakó presents detailed drawings in the sand which rapidly transform, leading the viewer into a visual experience of interwoven intellect. Cakó's cites the “constant room for... coffee, etc.) on top of a sheet of glass or Plexiglas. A camera mounted above the light table captures images as the animator moves the material in a stop-frame method. Most animators today will use a frame capture program such as Dragonframe to capture and review the animation as they are producing it. An animator will use a variety of tools to create the images, paint brushes, sieves, feathers, pointed sticks, and cone-shaped tubes, but the most important tool is the hands. Touching the sand provides an immediate connection with the material, its volume, its texture, its warmth from the light below, create an atmosphere of creative flow, opening the mind to experimentation, flexibility and risk-tolerance. This experimental frame of mind, catalyzed from the physical qualities of the material, ultimately gives rise to some of the common aesthetic traits we see both in historic powder animation films and in contemporary practice.
improvisation” as the reason he prefers sand to hand-drawn animation, an affinity which led him to develop sand as a medium for live performance, in which the material is manipulated under a live video stream and projected to an audience.[3]

In these early sand animation films, the artists are not overly concerned with realistic movement, but instead focus on the overall flowing of the material through its transformations. An animator will generally choose to have detailed design with limited movement, or expressive movement with simple design. As Gisèle Ansorge advises, “I don't want to recommend this technique to perfectionists… on the contrary, it is great for those with some fantasy, amateurs of the unexpected, and those who are impressed by the impulses of a fleeting second.”[4] We see the artists employ limited animation and strategic holds, moving only one part of the image to save time and effort. Often there is no background at all and the sand exists in an infinite white space, as in Caroline Leaf’s *The Owl Who Married a Goose* (1974). The sliding, shifting nature of the sand is at the forefront of the audience’s experience, as is the pure light coming from behind it. A sand artist may choose to make the sand the positive image, or allow the sand to cover the full frame and become the negative space, pulling the positive from the very light itself. Leaf manipulated both aspects masterfully in *The Owl Who Married a Goose*, switching from a positive dominant design to a negative dominant design halfway through the film. We see this also in Leaf’s *The Metamorphosis of Mr. Samsa*, (1977) as the sand becomes the negative material in Gregor's dark room, and the positive material in the world outside his isolation.

The final aspect evidenced across sand animation films is the artist’s reference to the material and the process itself. When the sand is thinly spread on the glass it is receptive to many different forms of mark-making, particularly the marks of fingers and hands. Texture can be created through a variety of tools, but it is also inherent in the grain itself, so artists are particular about the size and grain quality. The Ansorge’s used ground quartz sand dyed with black ink, Aleksandra Korejwo has her specific recipe for dying salts, and Caroline Leaf used beach sand from her childhood vacation spot in Massachusetts.

Working directly under the camera, the artists never fully disappear because we see their decisions in every frame. “It's like doing a performance because you do it once and that's it. It's sort of nerve-wracking, but you do it at a speed where you can control it and feel good about it,”[5] says Caroline Leaf of the process. The mark of the hand connects with our primordial desire to dig in the dirt, so it is not uncommon to see the hand of the artist physically on the screen at some point in the work, or a revelation of the material during the ending or opening credits. The recent popularity of sand animation performances, such as that by Ferenc Cakó and Kseniya Simonova, indicate that audiences are not only interested in the story and visual qualities of a film, but are fascinated by the artistic process and gain added meaning when they see a glimpse into the artist’s creative practice.

3 Contemporary Practice

Now let us move to the new generation of sand animators and new applications of the medium. Previously, artists shot on film, but now nearly everyone in stop motion is shooting with a digital camera. The transformation of a physical grain of sand into a
digital pixel has caused an evolution and a revolution that is currently expanding the creative applications of this mysterious material.

What attracts artist to the medium now is the same: the texture, the improvisational transformations, the high-contrast of positive and negative, and above all that primordial desire to dig in the dirt. Artists that have grown up in the digital era, or those who have successfully transitioned from film to digital, are embracing the desire to maintain a connection to physical processes. Most of what defines sand animation is still there: the obsession with texture, with light and dark, transformation and mark making. What has changed is the attainability of perfection.

Australian animator Marieka Walsh shot her first film, *The Hunter* (2011), on 35mm film. For her next film, *The Crossing* (2016), she used a DSLR camera and Dragonframe software to review frames as they are shot. Walsh explains, “Working on 35mm, I never saw anything until the negative was processed and at that point I was just happy the film processed okay. Now I become dissatisfied with the animation really quickly. But it has allowed me to improve my animation and add more detail. I have much more confidence.”[6] Walsh’s animation is highly detailed, with life-like movement across the entire frame and fine tonal renderings of intricate scenes. For her film *The Crossing*, Walsh closely followed live action reference footage for the movement of the characters. She also created full-frame sequences of ocean landscapes with subtle variations in texture and tones. Although this sometimes took her over 30 minutes to do one frame, the painterly quality of the material is exhibited as never before.

With the ability to rotoscope video footage or hand-drawn animation through stop-motion software programs, the tradeoff between detailed design and expressive movement is no longer so high. Often sand animation is assigned as an exercise in stop-motion classes at universities, so students become aware of the technique through their formal training, but find the lack of control intimidating. Creating hand-drawn test animation ahead of time makes the process friendlier for pose-to-pose animators as well as commercial investors. Now we begin to see more sand animation (as well as other fluid frame techniques such as paint-on-glass and clay painting) in paid commercial works because the concept can be visualized and revised before the time is invested in creating the final animation. In the advertisement *Coffee Art* (2013) for Canadian coffee giant Tim Horton’s, ground coffee and beans take the place of sand, telling the story of the coffee’s journey from source to shop through artful transformations. Because creating the intricate full-frame designs in various grinds of coffee would be time intensive and the production schedule was tight, director Alan Poon and animator Dale Hayward animated most sequences on paper to pre-visualize the ad for the client. Using the hand-drawn frames as a guide layer in Dragonframe, they were then able to proceed with intricate coffee confident that the end result would be approved[7].

In *Coffee Art*, there is an illusion of spontaneity and improvisation, but in fact the whole production was tightly controlled out of necessity. However, the opposite illusion can be true as well. In his film *Zepo* (2015), Cesar Diaz Melendez applies character animation techniques developed through years of working as a traditional and stop-motion animator on feature film productions to create a believable little girl who moves with the dynamic timing and poses of traditional character animation, even though she is animated entirely straight-ahead. Melendez cites the improvisational aspect of sand as what draws him to the medium and even in a narrative film like *Zepo*, he will rarely storyboard or keyframe: “Sometimes if a scene is very clear in my head I can just start, but if not I draw a rough [sketch of the pose] and then I start. But it’s always right before
I start to shoot.”[8] Despite his fluency in straight-ahead animation, Melendez notes that adding Dragonframe to his production workflow has actually slowed him down; “Before I worked very, very fast. Now I spend so much time looking at the monitors, always checking the animation.”[9] For contemporary animators, there is certainly a balance to be found between the improvisation of straight-ahead animation and the security of reference footage. What frame-capture programs and digital cameras have done for the technique is widened the spectrum so more animators can find their place of comfort in the medium.

This new generation of powder animators also bring a level of digital fluency to the medium through compositing and physical-digital hybridity. In his film The Well (2013), Philippe Vaucher uses a virtual multiplane by animating each character separately and then compositing them onto a background layer in Adobe After Effects. Coming from a character animation background, working in layers allows Vaucher to adapt some of the techniques used in traditional animation, such as cycles and shooting sequences backwards. The challenge of creating cycles in a textural substance like salt or sand is that the texture evolves progressively so that small changes in add up to a large jump when the cycle goes back to the first frame. Additionally, fine details, such the features of a character’s face, tend to be difficult to redraw precisely, so keeping a character on model is a challenge. In creating a walk cycle, Vaucher first moves his animation table along the north-south axis to create the up and down movement over the head, then redraws the character’s body in the salt, using Dragonframe’s onion skinning to align the limbs with the ground. He also hand-edits some frames in Photoshop to address the textural jump at the end of the cycle.[10] Working digitally also allowed Vaucher to change the color of his salt after the fact to suit the concept of the film and to incorporate digital pans and zooms to aid the story-telling. The result is a carefully controlled style of animation that rests between cinematic hand-drawn animation and experimental technique.

Digital compositing also allows sand to invade more traditional forms of animation. In Pilots on the Way Home (2014), Priit & Olga Pärn aimed for a visual style reminiscent of drypoint etchings for this erotic film about three pilots wandering through a wasteland on their journey home. With the aid of Dragonframe’s video reference feature, drawings were transferred from paper to onto a canvas of ultra-fine sand from the Piusa Caves in Estonia.[11] Sometimes one drawing might take a few days to recreate in the delicate sand, so much of the animation is efficient, making use of long holds and limited movements. The sand drawings are inverted and composited with other layers to achieve a final look that is thematically connected to the desolate psychology of the plot.[12]

My own film, A Tangled Tale (2013), introduces a similar level of complexity in compositing with the ultimate goal of achieving a unique aesthetic outside that of traditional monochromatic sand. The final look of the film was developed by layering traditional sand animation and background elements (Fig. 1).
As a first step, I shot the fish in black and white under the camera and then added color with a frame-by-frame hand-tinting process in Photoshop. In After Effects, I applied mesh warping to a still image of the plants, also created with sand, to give them a smooth undulation indicative of an underwater environment, which is virtually impossible to create under the camera. Finally, the delicate fishing line was drawn frame-by-frame in Photoshop. To bring all the elements together seamlessly, I applied a series of blending modes, masks, and effects, as well as digital pans and zooms.

From a personal standpoint, the benefits of working digitally were many. Coming from a character animation background, working in layers comes naturally to me and allows me to focus on one character in the animation stage to achieve lifelike movement. Vibrant color was also a priority, so adding complex, animated backgrounds to create an underwater environment was essential to the film’s integrity. But perhaps the largest enticement for me was, and still is, the uncharted territory of hybrid sand animation. The film presented new questions about what could be achieved with sand animation if the full application of digital tools were applied. Since making *A Tangled Tale*, I have further explored the possibility of color and mixed media in several commissioned projects, testing the flexibility of the hybrid process within different contexts. One of the side effects is that often this sort of animation falls outside the typical “look” of sand described at the beginning of this paper. As such, the digital tools act as a partial erasure for the hand of the artist, obliterating the viewers connection to the process. Educating the viewers then becomes an important element of production, whether it is through a
“Making of” video or some glimpse of the process within the film itself, should that understanding be a desired outcome or the work.

4 Conclusion

In summary, the new generation of powder animators have embraced the material for the unique qualities it has always exhibited. Recent films maintain an awareness of the individual grain, seen in texture and tone. Animators approach the sand table as sculptors of light, manipulating positive and negative spaces. We still find moments of fluid thought seen in morphs and transitions and loose narrative structure, even as there is a tightening of control over the individual grain and the precision of movement. Embracing this uncontrollable material requires flexibility and acknowledging the undeniable presence of the artist. As is typically the case, introducing digital technology to the traditions of powder animation does not necessarily save the artist time, but rather expands the scope of possibility for the medium by offering many more pathways of exploration. Ultimately, the magic is in the material itself and we are just at the beginning of the discoveries this animation technique has to offer.

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