

Team Project 1 Report

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Other Team 6 Members: Robert Vancleave, Luke McMullan, Quynchie Grenis

1. OBJECTIVE

In this project we wanted to slow down time by capturing an experiment on high-speed video at very high frame rate of up to 960 fps. By slowing down the event we wanted to examine it in detail looking for the formation of characteristic elements that we read about and seen captured by others. The motivation for this originated from the following video:

<https://www.youtube.com/watch?v=bmRYYelqT3w>

Using metal balls of varying gauges we repeatedly dropped the ball onto varying surface starting with sand and ending with water. The experiment we performed was intended to capture the **Worthington Jet phenomena**. By using the high frame rate video we hoped to capture the complete event including the signature elements of the crown and the drop forming above the impact site.

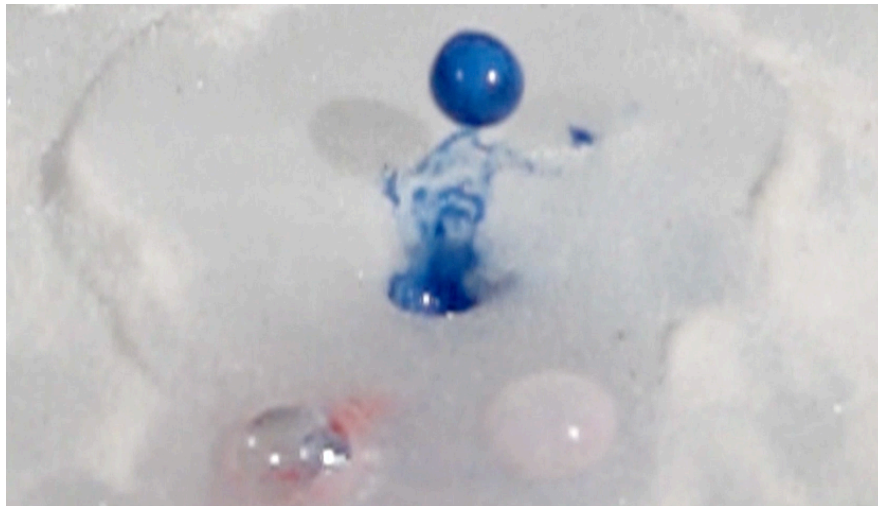


Image 1. Still from my video showing the formation of a perfect drop over the impact site

2. PROCESS

The video I chose for this project was the last one we shot that day and instead of using the steel balls I chose to play with dropping thick, undiluted poster paint into water. The surface of the water was covered with fine grain sand, which instead of sinking to the bottom like I expected floated on the surface forming a thin layer opaque film.

Image 2 on the next page shows the floor plan of the setup we worked with for this project.

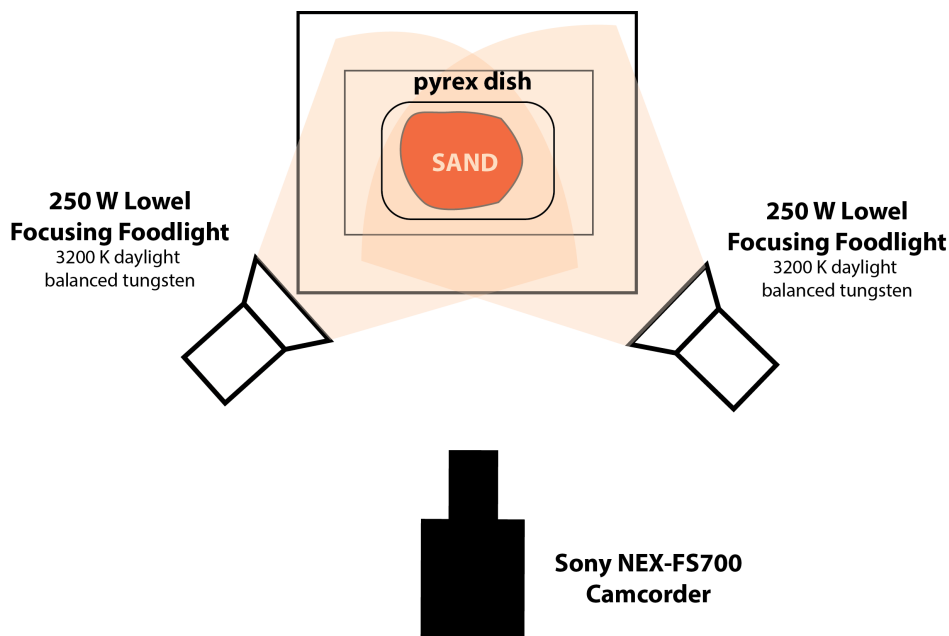


Image 2. Setup for Team Project 1 (top view)

After setting up the frame I have used placed a finger in the image to establish based on the cameraperson's input, in this case Rob Vancleave, I have roughly established the center of the frame in the real space and set focus. Using the undiluted paint straight from the original bottles to inject small amounts (about teaspoon at a time) into the sand covered water. I was using two colors of paint, pink and blue, holding them about

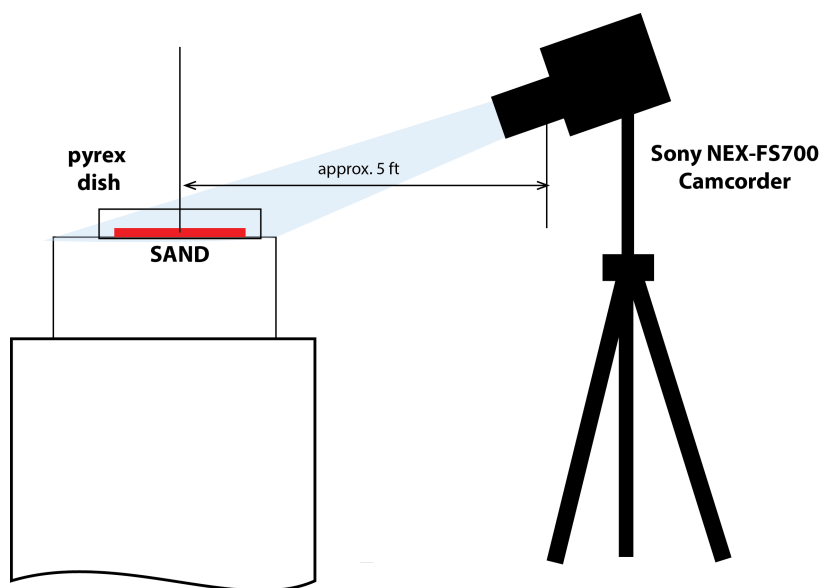


Image 3. Setup for Team Project 1 (side view)

The framed area of the sand covered surface of the water was about 8x5 inches. The camera was set to look down, about foot above the stage looking down at approximately 35% angle.

3. SETUP AND CAMERA

Using seeded boundary visualization technique in my image water was used as the clear medium and paint as the dye. The sand probably somewhat alters the definition of the visual technique since by covering the surface of the water it changed it's role as the transparent medium and as a result became an opaque medium similar to milk.

Materials

- Digital Video Camera capable of high speed shooting
- Tripod
- Two 250 Watt lights with stands
- Podium
- Clear apple box
- Pyrex dish
- Water
- Fine grain art sand (see Image 4)
- Two or more tempura paints (see Image 5)



Image 4. Bag of Scenic Sand (white)



Image 5. Bottles of the Pro Art Liquid Tempura paint used in the experiment

Light setup

- Two Lowell Pro-Light Focusing Floodlights, 250 Watts each
- Tungsten balanced



Image 6. Photo of the setup without Pyrex and water

4. PHOTOGRAPHIC TECHNIQUE

My video was shot on digital video camera capable of up to 960 fps video. The way FS700 camera works for slow motion video is that it records the frames to the memory for up to 12 seconds for 960 fps and 20 seconds for 480 fps, then the frames are transcoded as 1080p30 video (30 fps).

Frame rate buffered	Frame rate when record	Duration
960 fps	30 fps	32 sec

Table 1. Average duration HD video of the 1-second event

My video was shot at 960 fps then saved as 1080p HD at 30 fps. Slowing down the event approximately 32 times.

The reason for choosing this technique had to do with the duration of the event. Dropping something from 1 ft. into sand or water takes less than 1 second and the particular phases

of the effect can be measured in fractions of a second. To really appreciate the beauty of the phenomena we needed to slow it down so the individual stages are observable.

5. CAMERA, IMAGE AND POST

- Sony NEX-FS700 Camcorder with 18-200mm Power Zoom Lens
- Video was recorded as AVCHD HD1080p (1920x1080 pixels)

Exposure specs

ISO	2200
F-stop	5.6
Shutter speed	Auto (only option in high speed mode)
HD Format	1080p HD (1920x1080 pixels)
Frame rate	960 fps

Table 2. Camera settings for exposing the image

Post-production processing

All post was done with Adobe Premiere CC.

The image was cropped to focus on the most interesting part of the video. The original video is HD 1080 (1920x1080) and the edited video is HD 720 (1280x720), so while the image was cropped, no resolution was lost.

Only other postproduction processing included adjust saturation of the original image by increasing it by +35 using Hue/Saturation effect (see Images 7 and 8)

Editing

For this project editing included three major steps:

- Speed up the video another 200% to make a 2 minute video
- Reverse direction of playback (play backwards)
- Add sound (music also edited and processed like video, reversed but slowed down instead of speed up). All audio was edited in Adobe Audition CC

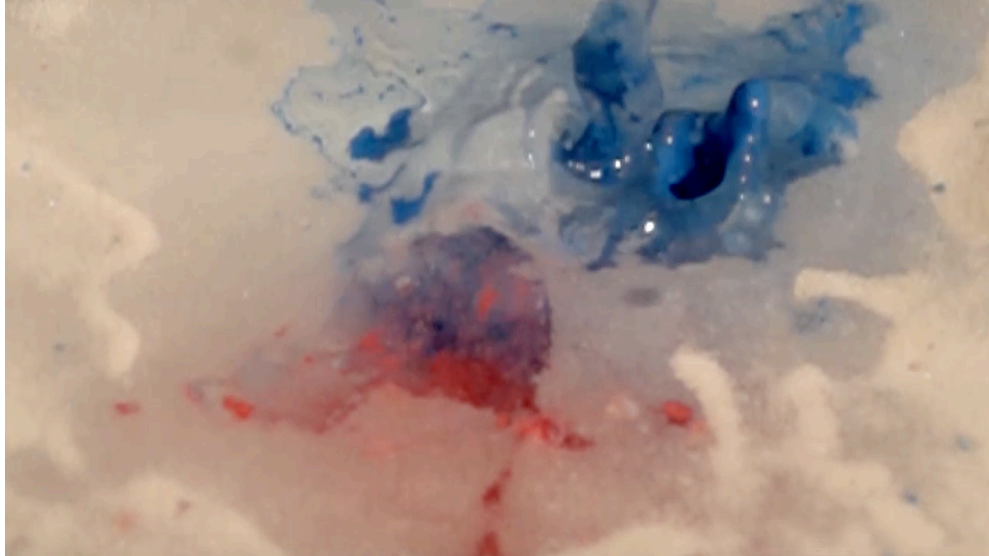


Image 7. Team Project 1 (<https://vimeo.com/142880044>)

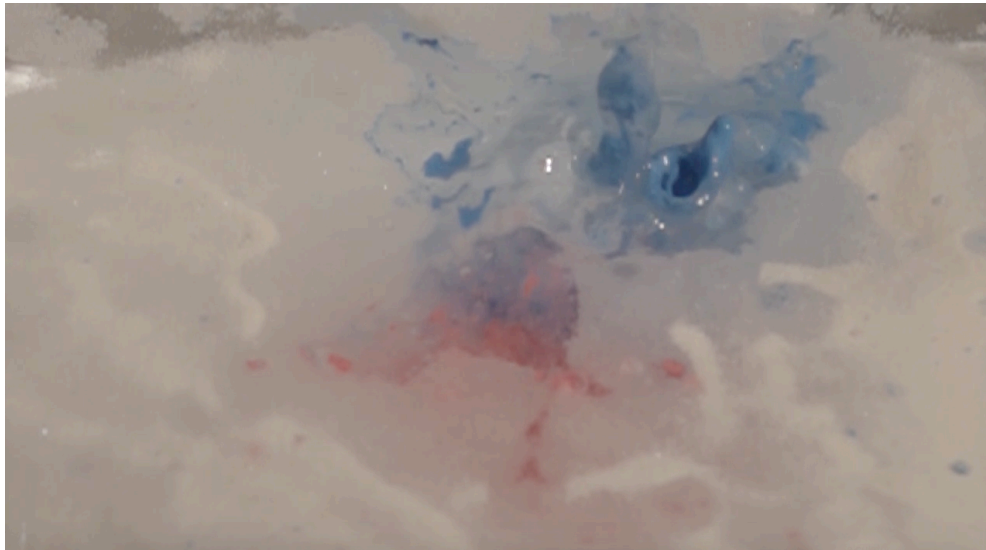


Image 8. Team Project 1 original video (<https://vimeo.com/142881886>)

6. REFLECTIONS

The image reveals the same elements of the crater forming followed by the reverse, an upward jet forming and when the jet reaches its full height and for a fraction of the second the remaining medium that the jet is formed of catches up at the top height of the jet forming a drop that appears to be suspended in mid air.

Considering the multiple drops in the video and varied results of only the crater and the column of the jet forming without the almost magically suspended DROP, some the

necessary factors to get the drop to form include the amount of paint being dropped, the shape of the paint dropped being round or elongated like an arrow and the height, so the level of force from which the paint is being dropped.

Through out the experiment we consistently used 1 foot over the surface of either sand or water to drop the ball or in my case inject paint as it seem to work well to produce results within the framed area.

“What do you like and dislike about MY image?” is a thought question to ask an artist since naturally in retrospective or if doing again I would do it differently. That’s the difference between ART AND SCIENCE; in art with each instance you innovate while science tries to repeat the same results. The playful postproduction in my mind took a step beyond a “failed” science experiment, which I liked. What I did not like and that’s purely technical is that the image had soft focus an what I find most aesthetically pleasing in this type of captured scientific video is that stark realism of the sharp image that only a camera can capture.

From science point of view based on few comments during the critique, the engineers in the class found watching the multiple drops hit the surface in REVERSE interesting but also enlightening and the nature of the flow. In which case, the video fulfills its intent and overall I am satisfied with the results both from both artistic and scientific perspective.

If working again with this experiment in the future I would create more deliberate system of dropping the paint to first allow more predictable placement of the phenomena in the frame. Later I found this artist, Jack Long who creates fluid flower arrangements using the fluid suspension technique. His work can be seen at jacklongphoto.carbonmade.com.