Planning A Project

1) Envision success.

   "Envision" is intentionally non-specific. Feel free to use non-technical language at this stage. Later you will make it more technical and concrete. E.g., in creating the Macintosh, Apple's goal was to make an "insanely great computer." . In the context of strobe lab, your vision should include some testable hypothesis about the subject you are studying.

2) Capture that vision as a set of concrete *deliverables*.

   Specificity here is critical. Deliverables must be observable, demonstrable things (a report, an image, a graph, an equation of best fit, etc.). You are basically stating that if, at the end of the project, you can present your deliverables, then you have achieved the success you envisioned. In the context of strobe lab, your deliverables should communicate what you learned about your hypothesis.

3) Devise a *method* for achieving your *deliverables*.

   Your method is a description of the general process you will use to create your deliverables. It is not the detailed procedure you will follow in the lab. . In the context of strobe lab, your method should explain how you will test your hypothesis about the subject you are studying.

4) Create a list of intermediate *milestones* that you must accomplish in succession to execute your *method*.

   Often you will discover that there is a component of the experiment that you don't know how to create. E.g., "We need a way to hold the balloon we're going to pop. And a way to pop it consistently!" The creation of each such component is a milestone for the project. For each such component, devise a method to borrow, build, or buy it.

5) Talk through your *method* and identify all equipment, materials, and supplies you will need.

   Sketches are often quite helpful. You may need to calculate some parameters (e.g., focal length of lens to use). You may need to estimate (or make an educated guess of) other parameters. Flag the items on your list that are not standard in the laboratory; you will need to identify who is to buy/build/borrow these items and when they are needed.

6) Create a *timeline* listing when each milestone must be accomplished and a *task list* of what actions must take place to achieve each milestone.

   Each task in the task list must identify the person responsible for doing it and when it must be done by. By agreeing to the task list and timeline, you are accepting responsibility for completing your tasks on time.

   Everyone must be committed to meeting the milestones as set down. Any slipping of milestones--particularly early milestones--is a cause for concern! It is easy to let an early milestone slip because of "more pressing" deadlines, but this is a recipe for disaster.

Example of Project Planning in Strobe Lab

Vision

We want to understand exactly what happens when a milk drop splashes, and when it happens. We want to get some killer images of the splash as well. We hypothesis that the process of the splash falls into some distinct stages. These stages might be

a) Drop impacting the plate
b) Crown rising
c) Crown falling
d) Puddle of milk rippling

Deliverables

Example Deliverables:
A paper report that

1) Itemizes the distinct phases that we identify as occurring in the process of the splash of whole milk, comparing them to our hypothesis above
2) States the typical time it takes each phase to occur
3) Presents clear, well-exposed and well-composed images characterizing each stage of the process of the milk-splash.
4) Repeats 1) through 3) for skim milk and heavy cream.

Method

Example Method
Set up a milk-dropping apparatus so that the drops strike a plate within the field of view of a camera.

Turn out the room lights and open the camera shutter. Let the falling drops of milk interrupt a beam-break system, which in turn starts a delay timer. When the preset delay has elapsed, the timer triggers a strobe to flash. Once the strobe has fired, close the camera shutter.

Repeat with varying delays until all stages of the process have been observed and imaged, and the duration of each stage measured.

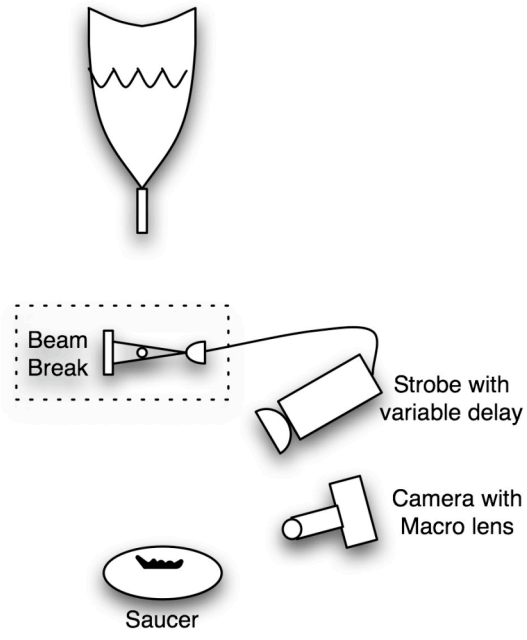

Figure 1. Proposed setup for imaging milkdrop

Setup

Figure 1 shows most items required and their schematic arrangement. The actual geometry follows. The funnel will be 300 mm above the plate, with the beam-break about 100 mm above the plate. The

camera will be 210 mm away from the splash [1], the strobe two feet from the splash [2]. The strobe will be about 30 degrees to one side of the camera to cast a shadow back on to one side of the splash.

Equipment, Materials, and Supplies needed (*Italicized* items need extra attention)

Funnel (with valve) to generate milk drops
Plate for drops to hit - color must give good contrast against milk!
Bowl or dish to catch spilt milk
Beam-break apparatus
Delay timer
Photocell and oscilloscope (to determine delay between beam-break and flash)
Cables to connect
Beam-break to strobe
(specify connectors)
Beam-break to oscilloscope
(specify connectors)
Photocell to oscilloscope
(BNC Female to BNC Female)

Lab stands and clamps to hold the funnel, plate, and beam-break apparatus
35-mm camera

105-mm Macro lens [1]
(can it focus close enough?)

Tripods for camera and strobe
Strobe - at least 7 BCPS [2] and flash duration of order 20 microseconds [3]

B/W film (ASA 400), at least **two** 36-exposure rolls [4]

Paper towels

Milk (whole and skim) and heavy cream

Calculations and assumptions made:

[1] We assume that we want to image a 48 mm by 72 mm area of the impact onto our 35-mm film, so our magnification m = 0.5. We know we have a 105-mm macro lens in the lab so we choose that. Applying the equations from the first lecture, we find that the camera-to-subject distance is 210 mm - but can the lens focus this close?

[2] We assume the strobe will be 2 feet away from the subject. Given the small subject, any reasonable strobe will be able to illuminate the image area from a distance of 2 foot (600 mm). If we use an aperture no more open than f/4.0 (to preserve depth of field), we find we need at least 7 BCPS.

[3] We are guessing that 20 microseconds will suffice for the flash duration, in part because we discussed this problem with Dr. Bales, who has observed this phenomenon using high-speed video. He said there is still some blur at an exposure of 1 ms (1,000 μs).

[4] If we have 4 stages of the event, and need to bracket each image +/- 1 stop, and do this for whole milk, skim milk, and heavy cream, we then need:
3 fluids x 4 stages x 3 separate exposures/image = 48 images.
Therefore, a single 36-exposure roll will not suffice.

Timeline and Task List

Example Timeline

19-21 Sept.	ID Strobe, confirm that lens will work, obtain cables, lab stands and clamps
21 Sept.	Test all cables and connectors
22 Sept.	Conduct Lab
23 Sept	Begin writing report (individual effort)
29 Sept	Lab report due at start of lab session.

Example Task List

Moe's Tasks:

18 Sept	Confirm with The TA that Lens will work, else find alternative lens.
19 Sept	Go into lab and layout equipment to determine what lab stands and clamps we need.
	Obtain required parts from Lab supplies
20 Sept	Email the team with an update on progress on the assigned tasks.
22 Sept	On way to lab, stop by LaVerde's & buy skim and whole milk, and cream.

Larry's Tasks:

18 Sept	Get list of possible strobes from The TA, email team with Larry's recommendation. Ensure that we reach a consensus on strobe choice.
20 Sept	Email The TA with our strobe choice
	Email the team with an update on progress on the assigned tasks.
22 Sept	Stay at Edgerton Center after lab, develop negatives that afternoon. Have them hanging to dry no later than 6:30 PM.

Curly's Tasks:

18 Sept.	Get from TA a listing of the connectors required for the cables above, and a listing of which ones are available.
19 Sept.	Borrow, buy, or build any cables required.
20 Sept	Test all cables, replace or repair any that don't work.
	Email the team with an update on progress on the assigned tasks.
22 Sept	Copy lab notes before 9 PM. Go to darkroom after 9 PM, cut negatives, put in film holder, and store negatives and copies of notes in lab group drawer.

Project Charter

One way to address the first few items (Vision, Objectives, and Deliverables) is to open the process by creating a *Project Charter*. The project charter is issued by (and signed by) the project sponsor–the person who can authorize the use of time, money and other resources to carry out the project. The person who actually needs the deliverables is called the *customer*, and the customer may (or may not) be the sponsor as well.

For example, suppose your project is to try to use high-speed video to help MIT's gymnastics team improve their athletes performance. Then the project sponsor is Dr. Bales (he authorizes your time as part of 6.163, and allows the use of the equipment). The customer, however, is the MIT gymnastics coach!

The purpose of the project charter is to document:

- Reasons for undertaking the project
- Objectives and constraints of the project
- Directions concerning how the project can be accomplished (e.g., preferred and/or excluded methods).
- Identities of the main stakeholders

Stakeholders are anyone involved in, or affected by, the project. If you exhaustively list the stakeholders at the start of the project, then you know exactly who all needs to know about the work and what is being done. You can then decide exactly how often each stakeholder needs to be updated, and how much detail they need to hear.

For the example above, stakeholders include the project sponsor and customer, the gymnasts on the team, and Christina, the 6.163 TA.

We will discuss project charters in more detail later in the term.

Project Planning Exercise

Photographing a balloon pop

Your group have agreed to travel to a local junior high school and give a one hour demonstration of strobe photography. You have spoken with the teacher, and have agreed upon the following.

- There will be 16 students present (all are 12 years old), with one teacher. Everyone in your group is working on this project.
- You will explain how the process works and demonstrate the process.
- You will use a digital camera that works just like the FM-10. The digital imager produces color images and has the same sensitivity as ASA 400 film. The imager is the same size as a 35-mm negative.
- You will not print out the images, instead you will give the teacher the memory card from the camera, who will print the photos out later that day.
- There will be several 110 VAC outlets available.
- The room can be made "pretty dark".
- The strobe at your disposal has BCPS = 200, and the hotspot is 3-feet in diameter at a distance of 4 feet.

Meet in your groups. In class work out a project plan for your topic. Include all six sections (*Objectives, Deliverables, Method, Setup, Timeline,* and *Task List*). Bring a neat copy of the project plan to class on Monday.