CAPSTAN AEROSPACE, LLC

Capillary Fluids Modeling with Surface Evolver

A two-day short course on zero-g and micro-fluidics capillary statics modeling.

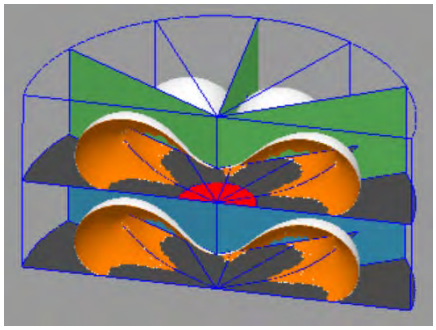
For fluids people, taught by a fluids person

August 11 and 12, 2025 at the Hilton Los Angeles Airport

Instructor: Steven Collicott, PhD (steven@collicott.com)

Cost of the class: $1,900 per person, Maximum of eight people in the class.
Note: food, lodging, parking, and transportation not included in this price.
Advance registration only, by July 9, 2025.

What is the course?

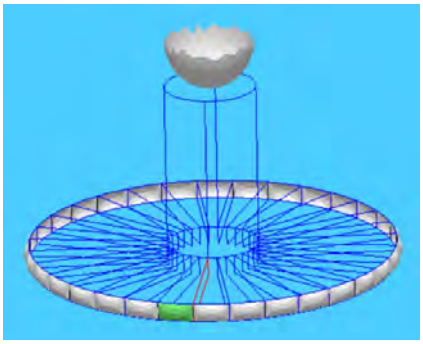


Surface Evolver is a computational tool useful for capillary fluid statics. This tool was developed decades ago on NSF funding and has been validated by experiments in ISS and elsewhere. The course is designed to help you conquer a common problem: advancing from the two fluids demo \s in *Surface Evolver* into doing your own original zero-g or micro-fluidics capillary fluids modeling. This first general-public offering of this course, delivered to engineers at industry clients numerous times, includes:

- Two days of instruction: presentations, group *Surface Evolver* exercises, some one-on-one coaching, fe-file creation, operations, debugging, quantitative output, grid management coaching, and more.
- Novel examples to demonstrate important features, choices, applications, extensions, etc. of *Surface Evolver*
- Novel examples to demonstrate important capillary fluid physics that are modeled by *Surface Evolver* and which are highly relevant to fluids in low-gravity and micro-devices in 1-g.
- Propellant tank and management device component and analysis examples.
- Capillary channel modeling.
- Use and concerns about use of symmetry planes.
- Basic automation of operations for overnight sweeps of parameter space.
- Example *Surface Evolver* files as in-class examples, lessons in fluid physics, and for students' future use.
- Hard-copy class notes which are a fluids person's explanation of how to model fluids problems in *Surface Evolver*.

What this course is not:

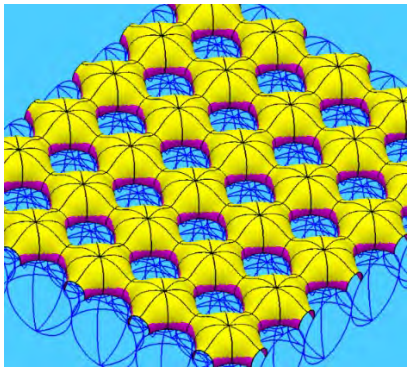
- It is not propellant management device design. Learning PMD design takes much longer than 2 days.
- It is not propellant slosh.
- It is not advanced *Surface Evolver* operations. In other words, if you already perform original fluids work in non-trivial geometries, then you won't appreciate this class. Yet, advanced coaching on your topics can be contracted separately with Collicott, email him.
- It is not how to run SE-Fit. But the fundamentals of *Surface Evolver* are taught, and these will enable you to become a good SE-Fit user, if you wish, more rapidly.



- *Surface Evolver* is not CFD, it has no time step, no d/dt and no equations of motion are modeled. *Surface Evolver* very quickly computes capillary fluid **statics** solutions with exceptional resolution of the liquid-gas interface and excellent volume conservation. It is a unique tool that complements CFD in a powerful way.
- Is not for debugging your own code using the instructor's time. One-on-one coaching and debugging aid focused on your own geometries can easily be contracted separately with Collicott, email him.

Steven H. Collicott, Ph.D., President steven@collicott.com 765-427-2619

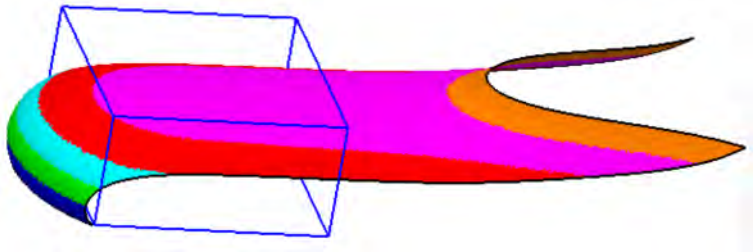
What the student needs to bring:



1. Notebook computer with *Surface Evolver* installed and operable.
   a. Note that your employer's IT staff may restrict what you can do, so do this step early. Some students have run *Surface Evolver* from a thumb drive.
   b. *Surface Evolver* is available to all, for free, from its creator: https://kenbrakke.com/evolver/evolver.html
   c. Try to run **`cube.fe`** and **`mound.fe`** demo files supplied with *Surface Evolver*.
   d. The Windows version is strongly recommended. The instructor can not help with Evolver installation or operational problems on Apple machines.
   e. A text editor with line numbers should be installed. Notepad++ is a free example.
2. A mathematics background typical of BS level engineering or science. If you once knew some basics of differential calculus with vectors, then you're fine.
3. Two committed days. We will have some phone and email breaks throughout both days, but it is wise to dedicate your time these two days to this task.

Venue

The Hilton at LAX airport. The Hilton has free shuttle service to and from the airport. Parking at the hotel is available, including for local students, for a fee to the hotel. No food service is provided as part of the class but options are presented on the hotel web site, https://www.hilton.com/en/hotels/laxahhh-hilton-los-angeles-airport/



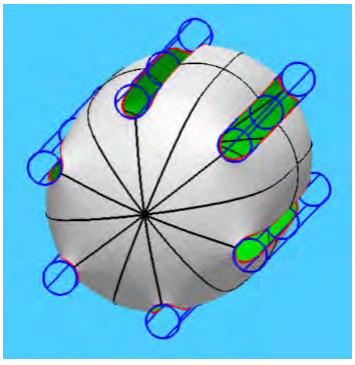
Schedule

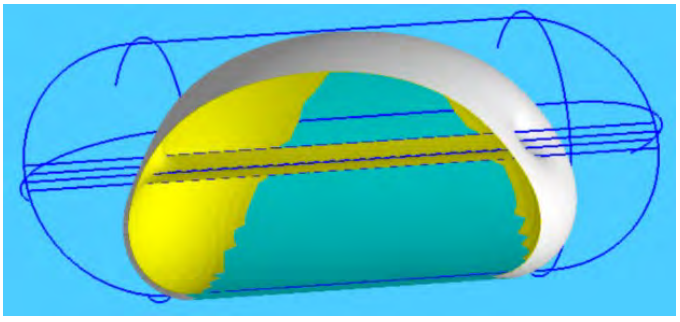
Beginning at 8:30am and running to 5:00pm both days. Approximately an hour for lunch, hourly short breaks for coffee, phone calls, email, etc. No meals, food, or drink provided as part of the class or registration fee.

The instructor

Steven Collicott, PhD, began using *Surface Evolver* in 1993 to test modeling of liquid and vaporous helium in the Gravity Probe-B spacecraft. Around 2000 he teamed with industry to use *Surface Evolver* as the first step in a successful thermal propellant gauging method for GEO satellites. He then used *Surface Evolver* to design the successful Vane Gap fluids experiment that operated in ISS in 2006-7. He is regarded as one of early adopters of commercial reusable sub-orbital rockets for fluids research, now having flown ten fluids experiments on Blue Origin's New Shepard rocket and one in Virgin Galactic's VSS Unity. He presently uses *Surface Evolver* for designing his next Virgin Galactic fluids experiment, with which he is slated to fly as a researcher in sub-orbital spaceflight.

To start the registration process, or to ask questions, email the instructor at steven@collicott.com





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